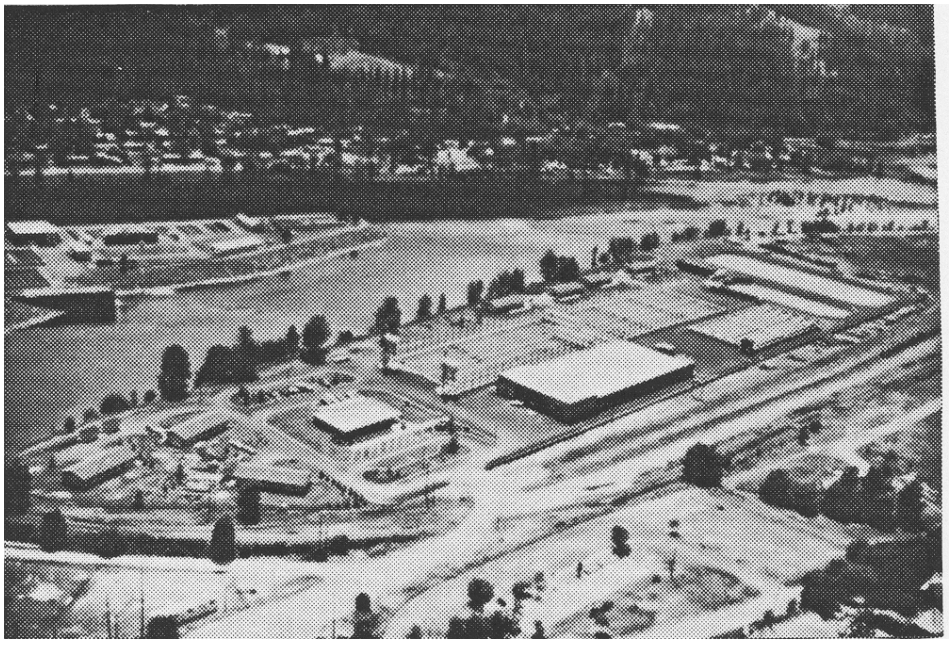
CLEARWATER FISH HATCHERY

1994 CHINOOK BROOD YEAR
1995 STEEHEAD BROOD YEAR REPORT



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IDFG 98-2
May 1998

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ABSTRACT

Clearwater Hatchery

Spring chinook salmon *Oncorhynchus tshawytscha* are raised at Clearwater Hatchery. All chinook were brought on station as either green or eyed eggs, then reared on station until they are transported to the satellite facilities or directly released.

Red River

Red River weir was installed on June 9, 1994 and taken out of operation on September 11, 1994. The run total was 31 chinook: 18 adult males, 13 adult females. Ten males and five females were released above the weir to spawn naturally, and eight males and eight females were held for spawning. A total of seven females were spawned, producing 30,634 green eggs, and resulting in a release of 24,002 full-term smolts from the Red River pond on April 10, 1996.

Crooked River

The Crooked River weir was installed on June 2, 1994 and taken out of operation on September 5, 1994. The run total was 26 chinook: 8 adult males, 17 adult females, and one jill. Five males and six females were held until they were ripe and released 10 miles above the weir. A total of 10 females were spawned, producing 44,406 green eggs., and resulting in the release of 37,071 full-term smolts from the Upper Crooked River raceways on April 10.

Powell

The Walton Creek weir was installed on May 27, 1994 and taken out of operation on September 5, 1994. The run total was 86 chinook: 30 adult males, 55 adult females, and one jack. All fish trapped were ponded and held for spawning. A total of 54 females were spawned, producing 252,045 green eggs, and resulting in the release of 232,731 full-term smolts on April 11 and 15, 1996.

Rapid River

Eyed eggs from 16 high BKD Rapid River females were transferred to Clearwater Fish Hatchery. A total of 67,818 full-term smolts were released at Hells Canyon on April 9, 1996.

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INTRODUCTION

Funding Source

Construction responsibility for the Lower Snake River Compensation Plan (LSRCP) was assigned to the Walla Walla District, Army Corps of Engineers (Corps), while responsibility for fish hatchery Operation and Maintenance (O&M) funding was to be accomplished by "One of the Federal fisheries agencies." The question of O&M funding was settled in 1977 with the signing of an interagency agreement by the Corps, National Marines Fisheries Service (NMFS), and the U.S. Fish and Wildlife Service (FWS). The agreement stated the FWS would budget for and administer O&M funding for LSRCP fish hatchery programs (responsibility for administration and O&M for fish passage and wildlife programs remains with the Corps).

The Corps estimated cost for construction of Clearwater Fish Hatchery and three satellite facilities was to be $43,153,000 (Joe McMichael's report December, 1991).

Location

Clearwater Fish Hatchery is located on the north bank of the North Fork of the Clearwater River, 1.5 miles downstream from Dworshak Dam, 72.5 miles upstream from Lower Granite Dam, and 504 miles upstream from the mouth of the Columbia River.

Red River satellite facility is located 15 miles east of Elk City, Idaho, 186 miles upstream from Lower Granite Dam and 618 miles from the mouth of the Columbia River.

Crooked River satellite facility is located 20 miles downstream of Red River. The trap is located one-half mile upstream of the mouth of Crooked River, a tributary of the South Fork of the Clearwater River. The juvenile rearing ponds are ten miles upstream from the Crooked River adult trap. Crooked River is 172.5 miles upstream from Lower Granite Dam and 604 miles upstream from the mouth of the Columbia River.

Powell satellite facility is located 122 miles east of the CFH at the headwaters of the headwaters of the Lochsa River. Missoula, Montana is the closest town, which is 45 miles east. Powell is 192.5 miles upstream from Lower Granite Dam and 624 miles upstream from the mouth of the Columbia River.

OBJECTIVES

Mitigation Goals

The goal of Clearwater Fish Hatchery and satellite facilities is to return 12,000 adult salmon and 14,000 adult steelhead over Lower Granite Dam.

Idaho Department of Fish and Game Objectives

The objectives of Idaho Department of Fish and Game (Department) for the Clearwater Fish Hatchery are to re-establish historic fish runs into the upper Clearwater River tributaries, to enhance the wild spawning population, and increase sport and tribal fish opportunities.

FACILITY DESCRIPTION

General Hatchery Description

Clearwater Fish Hatchery

The Clearwater Fish Hatchery is the final facility to be built by the U.S. Army Corps of Engineers under the LSRCP and is also the largest of the LSRCP hatcheries.

Support buildings include the administration/dormitory building. The dormitory section includes four bunkrooms with maximum capacity of 16 people, a living room, dining room, kitchen, shower rooms for men and women, and a laundry room. The administration portion consists of office space, a visitor center, and reception area.

The shop area including a vehicle maintenance shop and a smaller mechanical repair shop. A screen storage room has been altered for use as a carpentry shop.

The hatchery building also houses an incubation room and walk-in freezer; a screen and equipment storage building is located on the west end of the hatchery.

There are seven residences located on the hatchery grounds. Each residence also has a storage building.

Two 1.8 mile-long pipeline runs upstream to the Dworshak Dam. The pipeline goes up the face of the dam to an elevation of 1,357 feet (above sea level) then through the dam into the reservoir. The 18-inch pipe is stationary at an elevation of 1,357 feet with a screened inlet. This pipe supplies cool water to the hatchery. The 48-inch flexible plastic pipe is suspended from a floating platform. The platform has an electric winch to raise and lower the intake of the pipe to the level of desired water temperature. This pipe supplies warmwater to the hatchery.

Near the dam is a distribution structure designed to reduce the 286 pounds per square inch (psi) of the high pressure supply lines to the gravity flow of seven psi to the hatchery. The structure consists of a primary (warmwater) and secondary (cool water) chamber. Each chamber has two ported sleeve valves that are used to reduce the pressure. One valve is in operation while the other is on standby for emergencies.

The hatchery effluent water is treated with two settling ponds. The first is a 73,600 cubic foot (cf) cleaning sedimentation pond is used during cleaning to settle out the settleable solids produced by the hatchery. The second is a 414,000 cf final sedimentation pond settles waste from the total flow of hatchery operation and the out flow of the cleaning sediment.

Red River

The Red River facility has weir, an adult trap, two adult holding ponds, and a smolt rearing/acclimation pond. This site consists of four structures built on 6.29 acres. A feed building with a walk-in freezer, work shop, formalin storage building, and a support cabin with kitchen, dining room, living room, bathroom and bedroom.

Crooked River

There are two separate sites to this facility. The first site or the lower facility is used for adult trapping and consists of weir, adult trap, and support cabin. The support cabin consists of a shop, kitchen, dining room, living room, bathroom, and bedroom. There are no holding ponds at the site, and all adult fish are either released directly from the trap or transported to Red River adult holding ponds. The second site or the upper facility is located ten miles upstream and used for spring acclimation and summer rearing. This site includes two raceways, two effluent ponds, and support cabin. The support cabin consists of a garage, shop, walk-in freezer, kitchen, dining room, living room, bathroom, and bedroom.

Powell

The Powell facility has two weirs, an adult trap, two adult holding ponds, a smolt rearing/acclimation pond, and a pump house. One floating weir spans the Lochsa River and diverts fish into Walton Creek. This weir is not always used but is stored at the facility. A second weir spans Walton Creek and diverts fish into the ladder and adult trap. An open bay shelter provides spawning work space. Also, on site is a support cabin with a kitchen, dining room, living room, bedroom, bathroom, and walk-in freezer. During the summer of 1994, the Corps of Engineers constructed a formalin storage building.

Production Capacities by Unit

Clearwater Fish Hatchery

Adult Holding

The adult holding facility consists of two ponds with a combined capacity of 8,000 cf and a maximum holding capacity of 800 adult salmon. There is also a covered spawning area with two live wells for on-site egg taking. This facility is supplied with water from the tail race of the juvenile chinook raceways. Estimated flow per pond is 3.5 cfs.

Incubation

The main incubation room contains 40 double stack Heath incubators with a total of 640 trays. The upper and lower half of each stack (eight trays each) has a different water supply and drain. This design aids in segregation of diseased eggs. The maximum capacity of this facility is five million green eggs. The incubation room is supplied with both water sources to provide the desired temperature for incubation, with a flow of five gallons per minute (gpm) to 8 gpm per one-half stack.

Isolation incubation is a separate building between the chinook raceways and main hatchery building. This building isolates 10 double stack Heath incubators with a total of 160 trays. This facility is used to incubate eggs from parents of unknown disease background. Water is supplied from both warm and cool water sources.

Early Rearing

Sixty concrete vats, measuring 40 ft x 4 ft x 3 ft deep, are located inside the hatchery building for early rearing and contains 480 cf of rearing space in each. This part of the facility can rear 5.9 million fish to 287 fish/lb at a 0.3 density index (DI). The vats are supplied with water from each intake and have a flow of approximately 120 gal per vat when all vats are in use. Every vat also has an incubation jar plumbed directly into them; the incubator jars have a total capacity of 2.6 million eggs with a flow of 15 gpm per jar.

Steelhead Raceways

Steelhead final rearing consist of 24 (300 ft x 10 ft x 6 ft) raceways that are supplied with primary and secondary water by a center head raceway with an east and west bank. The total rearing space is 216,000 cf. This area will rear a maximum capacity of 2.4 million steelhead smolts with 0.3 DI (Piper). A total of 40 cfs is available for rearing (1.67 cf per raceway). This flow has a maximum rearing capacity of 1.7 million steelhead smolts with 1.2 flow index (FI) (Piper).

Chinook Raceways

Chinook final rearing consists of 11 (200 ft x 10 ft x 3 ft) raceways that are supplied with primary and secondary water. The total rearing space is 66,000 cf. This area has a maximum rearing capacity of 1.5 million smolts with 0.3 DI (Piper). A total of26.4 cfs is available for rearing (2.4 cfs per raceway).

Satellites

Red River

The adult holding facility consists of two ponds (10 ft x 45 ft x 4 ft) with a total holding capacity of 3,400 cf and trap (8 ft x 16 ft x 4 ft). These ponds have a holding capacity of 250 fish each. A removable tripod and panel weir block fish passage and diverts them into the fish ladder. In 1996, the weir was redesigned and 17.5 floating section constructed. This new design allows steelhead trapping during early season high flows. Water flow through the ponds and trap is 4.09 cfs.

A 170 ft x 70 ft x 4.5 ft rearing pond will rear a maximum of 320,000 chinook smolts. This pond has a hypalon plastic liner with eight to ten inch diameter cobblestones on the inclined banks. The bottom of the pond is a bare liner, which aids in pond vacuuming. A catwalk runs the entire length of the rearing pond and holds eight automatic Nielson feeders. Water flow through the ponds is 4.09 cfs.

Crooked River

The upper facility has two raceways, measuring 145 ft x 20 ft x 4 ft, for a total of 23,200 cf. these raceways have a capacity of 700,000 juvenile chinook with a 0.29 DI. Water flow per raceway is six cfs. Each raceway is outfitted with three automatic Nielson feeders.

The adult trapping, at the lower facility, measures 10 ft x 12 ft x 4 ft with a total of 480 cf. Water flow for the adult facility is 10 cf. There is no adult holding, therefore, all fish are released or transferred to the Red River facility.

Powell

The rearing pond measures 165 ft x 65 ft x 5 ft and has 53,625 cf of rearing space. The maximum design capacity is 500,000 fish with a DI of 0.092, however, normal loading is 320,000 smolts. Water flow through this pond is 6.24 cfs. A catwalk across the length of the pond supports eight automated Nielson feeders.

The adult ponds each measure 100 ft x 20 ft x 4.75 ft have a volume of 9,500 cf and a holding capacity of 960 adult chinook. The adult trap measures 12 ft x 6 ft x 4 ft and is supplied with 6.24 cfs.

WATER SUPPLY

Source

Clearwater Fish Hatchery

Clearwater Fish Hatchery receives water through two supply pipelines from Dworshak Reservoir. The warmwater intake is attached to a floating platform and can be adjusted from five feet to forty feet below the surface. The cool water intake is stationary at 1,357 elevation or about 245 ft below the top of the dam. An estimated 10 cfs of water is provided by the cool water supply and 70 cfs of water from the warmwater supply. The cool water supply ranges between 36^0F and 40^oF. The warmwater can reach 80^oF but is adjusted regularly to maintain 56^oF for as long as possible throughout the year (Appendices A.1). All water is gravity flow to the hatchery.

Red River

Red River is supplied by gravity flow from an intake located on the riverbed of the South Fork of Red River, 225 yd upstream from the facility. The water right for the facility is 8.18 cfs. During low flow in the summer, about five cfs is available to the hatchery. Temperatures ranged from 33^oF in the fall to 74^oF in early August (Appendix A.2). There were fourteen days during the summer of 1991 when water temperatures reached 70^oF or higher.

Crooked River

The upper facility raceways are supplied by gravity flow from an intake 200 yards upstream of the support cabin. The water rights stipulate cfs at the rearing facility; in late summer only six cfs is available.

The water right is for 10 cfs at the adult trapping facility. Temperatures ranged from 68^{o}F in mid-August to 34^{o}F in late September (Appendix A.2

Powell

The intake is located 100 yards upstream from the facility. Powell's water right is 6.24 cfs from a gravity flow system on Walton Creek, and 2.5 cfs of pumped water from White Sands Creek. Two 7.5 horsepower pumps can be used to supply Walton Creek with water from White Sands Creek during periods of low water. Water temperatures ranged from 45.8^{o}F to 50.2^{o}F from the Walton Creek intake and 41^{o}F to 65^{o}F from the White Sands pump station (Appendix A.2)

Water Quality Analysis

Clearwater Fish Hatchery

The Idaho Department of Health and Welfare water quality laboratory in Boise analyzed water quality. Samples were taken from the hatchery incubation supply line on August 4, 1994 showed a total alkalinity (as $CaCO_3$) of 16 mg/l, which is very low with regard to fish culture. (Appendix B.1).

Red River

Water quality analysis taken at the facility rearing intake on July 20, 1994 showed no apparent problems (Appendix B.2).

Crooked River

Water quality analysis taken at the facility rearing intake on July 14, 1994 showed no apparent problems (Appendix B.3).

Powell

Water quality analysis taken at the facility rearing intake on July 27, 1994 showed no apparent problems (Appendix B.4).

STAFFING

Clearwater Fish Hatchery has eight permanent staff members; one Fish Hatchery Manager II, two Assistant Hatchery Managers, one Utility Craftsman, three Fish Culturists and an Office Secretary. The rest of the crew consists of temporary employees with the positions as Fishery Technicians, Biological Aides, Laborers, and Youth Conservation Corps enrollees. Each facility, the Red River, Crooked River, and Powell facilities are manned by one temporary person, which are supervised from the Clearwater Fish Hatchery.

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Adult Chinook Collection

Red River

The weir and trap were put into operation on June 1, 1994 and was taken out of operation September 11, 1994. A total of 31 fish were trapped, 18 adult males, and 13 females (Appendices D.1, D.4, E.1, and E.4). Water flow through the trap for adult attraction and adult holding pond is 4.5 cfs.

Ten adult males and five adult females were released directly from the trap above the weir to spawn naturally. Eight adult males and eight adult females were ponded and held for spawning. One adult females died prior to spawning (Appendix F.1).

The first female was spawned August 19 and the last on September 2, 1994. A total oa seven females spawned 30,634 green eggs in four takes (Appendix C.)

Age-class breakdown of this run was 9 four-year-old males, 9 five-year-old males, 9 four-year-old females, and 4 five-year-old females. The age-class breakdown was as follows: less than 25 inches (64cm) were jacks, over 25 inches (64cm) to 32 inches (82cm) were 4-year-olds, and 32 inches (82cm) and over were 5-year-olds (Appendices F.1 and G, I.1). The breakdown is from limited historic Coded-wire Tag (CWT) data from Ron Lindlund and Rodney Duke.

Crooked River

The weir and trap were put into operation on June 2, 1994 and taken out of operation on September 5, 1994. A total of 25 fish were trapped, 8 males, 18 females, and 1 jill (Appendices D.2, D.4, E.2 and E.4). Flow through the trap for adult attraction was 10 cfs.

There is no adult holding at this site. Fish trapped from this facility must be transported 28 miles to the Red River facility. These adults were held separate from the Red River stock.

There were no adults released directly from the trap above the weir to spawn naturally. Five adult males and six adult females were ponded, held until ripe, then released into a confined section of the upper Crooked River drainage to spawn naturally. Pre-spawning mortality was recorded as one adult male and two adult females (Appendix F.2).

The first female was spawned August 23 and the last on September 9, 1994. A total of ten females spawned 44,406 green eggs in six takes (Appendix C).

Age-class breakdown of this run was one jill, 2 four-year-old males, 6 five-year-old males, 13 four-year-old females, and 4 five-year-old females. The age-class breakdown was as follows: less than 25 inches (64cm) were jacks or jills, over 25 inches (64cm) to 32 inches (82cm) were 4-year-olds and 32 inches and over were 5-year-olds. Breakdown is from limited historic CWT data (Appendices F.2, G and I.2).

Powell

The weir and trap on Walton Creek were installed on May 27, 1994 and was taken out of operation on September 5, 1994. A total of 86 fish were trapped, 30 males, 55 females, and one jack (Appendices D.3, D.4, E.3 and E.4).

The floating weir across the Lochsa River was not installed this year. All fish returning to the Powell trap were considered hatchery stock. All fish trapped were ponded for spawning. Flow through the trap and ponds were 6.2 cfs. Pre-spawning mortalities were one adult male and one adult females for a mortality rate of 3.4% (Appendices F.3).

The first female was spawned August 1 and the last on August 29, 1994. A total of 54 females spawned 252,045 green eggs in eight takes (Appendix C).

Age-class breakdown of this run was one jacks, 10 four-year-old males, 20 five-year-old males, 18 four-year-old females and 37 five-year-old females. The age class breakdown was as follows: less than 25 inches (64cm) were jacks, over 25 inches 64(cm) to 32 inches (82cm) were 4-year-olds, and 32 inches (82cm) and over were 5-year-olds. Our breakdown is from limited historic CWT data from Region 2 Fisheries Biologist (Appendices F.3, G and I.3).

Holding and Spawning

Ponded fish were injected with Erythromycin 200 to inhibit Bacterial Kidney Disease (BKD). Fish being held for spawning were also treated every other day with 100 ppm formalin drip for one hour. After the first sorting, all fish were treated every day with 100 ppm formalin drip for one hour.

Eggs were water hardened in a 100 ppm Argentyne solution for one hour in egg tubes, drained and transported in fresh water to Clearwater Fish Hatchery for incubation. Tissue and ovarian samples were collected at the time of spawning. These samples were air mailed the next day to Eagle Fish Health Lab for BKD and virus testing. (See Appendix C for individual egg take numbers.)

Egg Transport

All green eggs were transported to Clearwater Fish Hatchery. The transport vehicle was met at the front gate, and egg tubes were removed from egg coolers, and placed in clean egg coolers containing 100 ppm Argentyne solution for ten minutes. The clean egg coolers were then taken to the incubation room and eggs were placed into Health egg trays with one or two females per tray.

Rapid River

During the 1994 spawning seasons, eyed eggs from high BKD parentage were received from Rapid River Hatchery, located in Riggins, Idaho. Clearwater Fish Hatchery received a total of 58,091-eyed eggs (Appendix C.)

Clearwater Fish Hatchery

Incubation

A total of 327,085 green eggs were incubated from BY94 spring chinook salmon: 252,045 from Powell stock, 30,634 from Red River stock, 44,406 from Crooked River stock. Overall eyed-eggs numbered 303,500 for a total eye-up percentage of 92.7%. Powell achieved a 94.3% eye-up, Red River 87.6% eye-up, Crooked River 87.9%.

A total of 58,091 eyed eggs from Rapid River high BKD stock.

Eggs were treated with formalin to minimize fungal development. Treatments were administered three times per week at a 1:600 concentration (1667 ppm) for 15 minutes and continued until each egg lot accumulated 800 thermal units (TU).

Eye-up occurred at approximately 500 TU, at which time all egg lots were shocked and picked using a Jensorter egg picking machine. The electronic counter on the Jensorter was used to enumerate all egg lots. All egg trays and screens were pressure washed clean before any eyed-eggs were placed in them for final incubating.

Prior to hatching, all eyed-eggs were picked a second time. The second pick occurred at approximately 750 TU. Hatching occurred at approximately 1060 TU, at which time all egg lots were picked a third time. All trays received a fourth and final pick at 1500 TU to remove any dead yolk-sac fry. Swim-up fry were transferred to the early rearing vats at approximately 1750 TU. Survival of green eggs to swim-up fry averaged 92% (Appendix C).

At eye-up, all Powell chinook eggs from high and medium BKD parentage were segregated from the low and negative BKD parentage. This segregation lasted through release. There were no high BKD chinook at Red River and Crooked River during brood year 1994.

Early Rearing Procedures

At swim-up, fry were moved to hatchery vats 29 through 40 with a loading of approximately 30,000 fish per vat. Survival from eyed egg to swim-up was 299,361 fish (99%). This percentage does not include the Rapid River stock. All fish were divided as evenly when loaded into vats, separating by stock, spawning dates, and BKD optical densities. Fish were started in a full length baffled vats. Initial water flows were set at 46 gallons per minute for approximately 10 days to start the fry on feed. Water flows were increased to 92 gallons per minute on day 11 and remained set at that rate until day 60, when flows were increased to 120 gallons per minute. Flows remained at 120 gallons per minute for the remainder of early rearing. Flow indices were held at or below 0.5 while DI never exceeded 0.3 during the entire early rearing period.

All spring chinook were fin-clipped and coded-wire tagged while being moved from early rearing to final rearing. All chinook were between 80 and 120 fish per pound when moved to final rearing.

No significant fish mortalities occurred during early rearing.

Water temperatures, during the early rearing period, ranged from 40°F to 54°F (Appendix A.1). Whenever the water temperatures exceeded 52°F for more than two days, lowering the primary intake or adding more secondary water cooled the water temperature.

Bioproduct starter and Biodiet grower formula were used to feed all lots of fish during early rearing. A total of 4,844 pounds of food was used at a cost of $5,619.04. The conversion rate for this period was 1.41 pounds of feed for one pound of gain.

Final Rearing Procedures

A total of 367,474 fish were transferred outdoors to chinook raceways for final rearing. Powell chinook were moved into raceways 1A through 6A. Crooked River chinook were transferred into raceway 7A and Red River chinook into 8A. Rapid River high BKD chinook were moved into chinook raceways 7B and 8B. The Powell high BKD fish were moved to raceway 6B.

All spring chinook salmon were reared to full-term smolts at Clearwater Fish Hatchery and received two medicated feed treatments during final rearing. The fish treatment was immediately after marking and moving outside, and the second in October prior to cooling water temperatures. The fish were fed Bioproducts feed with 2.25% Aquamycin 100. The fish were fed between 75 and 150 mg Erythromycin per kilogram to comply with Investigational New Animal Drug (INAD) specifications.

The Powell stock (raceways 1A through 6A) full-term smolts were put in an experimental rearing test. Test raceways 1A, 5A and 6A were painted camouflage patterns to simulate natural stream colorations, and floating shade structures made of PVC heavy plastic netting (approximately 50% shading) were placed the length of the raceways. Raceways 1A, 3A, and 4A were control raceways which incorporated standard rearing practices. This was the third year for this experiment.

The most noticeable difference of behavior occurred in the first three weeks after the fish were ponded. Fish in the camouflage painted raceways reacted a lot more calmly as you walked by on the catwalks than fish did in the normal raceways. After approximately three weeks, the algae covered the painted concrete walls and fish in painted raceways and non-painted raceways reacted about the same as you walked down the catwalks. The painted concrete floors continued to remain visible because of raceway cleaning exercises performed three times per wk. The chinook utilized the shade provided in the natural rearing raceways, especially during the summer and early fall when raceway walls provided very little shade.

Bioproducts' Biodiet grower feed was the diet used throughout the final rearing period. A total of 30,504 pounds of fish food was used during final rearing at a cost of $22,745.84. Total feed used in early and final rearing was 35,348 pounds at a cost of $28,364 (conversion rate of 1.6). Percent body weights fed ranged from 1.2 to 5.0 percent (Appendix J).

Most chinook salmon were fed a week-on, week-off feeding program from July 1995 to February 1996. Fish were fed continuously during the weeks of medicated feed treatments. This feed regime was done to slow down growth, yet maintain fin quality and maintain fat reserves. No effects from this were detected; fin quality and fat reserves remained excellent. This program worked well at minimizing fish size but caused poor feed conversions as a result.

Water temperatures during the final rearing period varied from 36 to 59^{0}F (Appendix A.1). Every effort was made to maintain temperatures below 52 F. An estimated 2 cfs of water supplied each raceway.

Fish Health

Diseases Encountered and Treatment.

Chinook fry and juveniles (of all stocks) were given two prophylactic treatments of Erythromycin medicated feed to suppress *Renibacterium.* These treatments have stopped clinical outbreaks of BKD at Clearwater Fish Hatchery in the past, but this year, just prior to release, the Rapid River high BKD segregation group showed clinical signs of this disease. Both Direct Fluorescent Antibody Test (DFAT) and Enzme-Linked-Immunosorbent-Assay (ELISA) testing showed levels of infections which could indicate the onset of an epizootic. At the time of inspection this particular raceway was not in an epizootic state, but if kept in the raceway situation longer without treatment, an epizootic was probably inevitable. Otherwise, the chinook at Clearwater Fish Hatchery had virtually no problems with disease.

Acute Losses.

Acute losses were not experienced on this facility during the reporting period. Chronic losses at this facility are usually associated with Motile Aeromonas Septicemia (MAS) or *Flexibacter psychrophilus*.

Organosomatic Index.

Index is provided for stocks for the samples taken (Appendices L1, L2, L3, and L4).

Other Assessments

Clearwater Fish Hatchery has had several high BKD segregation programs since BKD segregation was implemented at this facility. The hatchery has had very little disease associated with the high segregation group (including this year). Yet, as was noticed this year, clinical signs/disease can manifest and possible cause mortality after release. In the near future, we will try to implement a high BKD rearing strategy and release strategy. The rearing strategy for high BKD segregation groups will most likely include three Eryghromycin medicated feed treatments and at least one Oxytetracycline medicated feed treatment. Other factors such as density, flow, and enriched feeds will be considered as part of this strategy.

The release strategy will be a matter of timing of release of these high BKD groups or possibly a different location. High BKD groups should be released later than the other production groups to limit horizontal transmission of *Renibacterium.* High BKD groups should be differentially marked so the Department can assess the success of this program.

This year's fish released at Crooked River did not develop the cataracts as in years past. At present, there is no explanation why this anomaly did not occur.

During the last few months of final rearing, a feed regime was initiated and a micro-nutrient enhanced feed evaluation. This study is a continuation of work initiated last year when studies

indicated higher levels of these micronutirents in the tissue of wild fish. A comparison was done on micro-nutrient enhanced feed to regular feed using two different feeding regimes, one with a week-on, week-off schedule, and the other with full daily ration, in addition, four replicates of these four groups totaling sixteen test groups, each 120 smolts. One hundred fish from each group was tagged with Passive Integrated Transponders (PIT) tags to be released and detected at Lower Granite Dam in order to compare the effects of feeding regime and additional micro-nutrients on smolt survival and migration.

The remaining 20 fish from each group were analyzed using Goede's autopsy method to compare general health and condition differences. A peroxidation assay was used to test red blood cell wall strength and oxidation resistance. Preliminary results indicate there is a definite difference between the enhanced and regular feed groups with increased cell wall strength and oxidation resistance in the enhanced diet groups. No differences have been noted between the different feeding regime groups to date.

Finally, liver and spleen samples from the autopsied fish will be used for quantitative analysis of the tissue micro nutrient levels. Gill samples were also collected for analysis of Adenosine Triphosphate (ATP-ace) activity to compare levels of smoltification between the groups. A graduate student from the University of Idaho, in completion of his thesis, will be compiling the data and completing the statistical analysis on this project.

Fish Marking

All brood year 1994 spring chinook released from Clearwater Fish Hatchery were marked with either a right ventral (RV) or adipose (AD) fin-clips. All Powell chinook were marked with an AD-clip, and an additional 129,096 fish received CWT and 11,420 received PITs. All Crooked River chinook were AD-clipped. A group of 2,100 Crooked River stock was also PIT tagged. All Red River chinook were RV-clipped with a group of 1,214 PIT tagged as well. All Rapid River stock received AD fin clips and no PITs or CWTs (Appendix H).

Fish Distribution

Full-term smolt

A total of 24,002 smolts were released from the Red River facility after 15 days of acclimation. These fish were transported to Red River on March 25 and released on April 10, 1996. A total of 37,071 smolts were released from the Upper Crooked River facility after 14 days of acclimation. These fish were transported to Crooked River on March 26 and released on April 10, 1996. A total of 232,731 smolts were released from the Powell facility. Also, on March 25 and 26, 221,191 smolts from low BKD parentage were transported to the Powell rearing pond for a two-week acclimation and released on April 11. A total of 11,540 smolts from high BKD parentage were direct released into Walton Creek from smolt trucks on April 15, 1996. On April 9, 1996, 67,818 Rapid River stock were released at Hells Canyon Dam (Appendix K). There is a difference between the number of eggs received and number of fish released. The eyed egg numbers was an estimate, which was less than the number actually received. The release number was from a hand count provided by Rodney Duke's marking crew.

BROOD YEAR 1994 and 1995 STEELHEAD REPORT

ABSTRACT

Clearwater Fish Hatchery received 911,153 eyed BY95North Fork B-run steelhead eggs from Dworshak National Fish Hatchery (DNFH). A total of 603,118 smolts from the North Fork stock were released from April 17 through April 24, 1996; 121,290 at the confluence of Cottonwood Creek; 126,009 upstream from the town of Stites; 185,214 at Red House hole, and 126,290 at Kooskia Hatchery on Clear Creek. Also, 8,000 North Fork stock fish were released into the South Fork of Red River. The size of fish at release for the one year rearing cycle was 7.6 fish per pound, for a total of 77,716 pounds and average length was 178.7mm (7.29 in).

A total of 47,226 North Fork B-run steelhead were released as pre-smolts in the South Fork of Red River on September 6, 1995. Size at release was 57.9 fish per pound.

In addition, 165,837 BY94 North Fork stock were reared on a two-year cycle. On April 19, 1996, 135,837 of these fish were released at Kooskia Hatchery in Clear Creek. Fish reared on the Two-year rearing cycle were 6.2 per pound, for a total of 21,909 pounds and average length was 173mm.

Final numbers for the BY94 Selway/North Fork were 7.49 fish per pound, for a total of 6,994 pounds and average length of 7.25 inches. These fish were raised on a two-year rearing cycle and released in Crooked and Red Rivers. In addition, 67,516 eyed eggs from a mixture of Selway and North Fork stocks were received at Clearwater Fish Hatchery. Fish from the Selway stock eggs will be on a two-year rearing cycle and released as full-term smolts in the spring of 1996.

A total of 173,296 pounds of feed was fed (137,613 Rangen, 34,683 Bioproducts) with a cost of $72,644.72 to produce 107,448 pounds of fish at Clearwater Fish Hatchery. The conversion rate was 1.65.

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Clearwater Fish Hatchery

Synoptic History

Brood Source

Dworshak National Fish Hatchery (DNFH) was the source for North Fork stock B-run steelhead eggs.

Disease History

The DNFH has a long history of Infectious Hematopoietic Necrosis Virus (IHNV), therefore, Clearwater Fish Hatchery only accepts steelhead eggs from IHNV-negative females and follows a strict propolatic protocol.

Spawning

Dworshak North Fork Stock:

Our egg request is for adult fish spawned during the later part of the run, which was egg takes 8 and 11. When eggs were being collected for Clearwater Fish Hatchery at DNFH, one or two of our crew would assist with their spawning operation. Hatchery personnel collected and packaged all the disease samples to ship by airmail to Eagle Fish Health Lab.

Incubation

Dworshak North Fork Stock:

A portion of the BY94 North Fork steelhead held on a two-year rearing program were initially incubated as part of the one year program and not separated out until August 1994.

BY94 Selway/North Fork Stock:

A total of 67,516 eyed eggs were received from DNFH on May 11 to May 17, 1994. A pre-determined number of eggs were placed in each egg tray according to loading charts developed by National Biological Service (NBS) (Appendix N).

Dworshak BY95 North Fork Stock:

Eyed steelhead eggs were received from DNFH on April 31 to May 24, 1995 in five weekly shipments (Appendix M). The eggs from DNFH lots 8 through 11 were incubated approximately 17 days at DNFH until the eggs were eyed-up. All eggs from negative IHNV females were disinfected and transported to Clearwater Fish Hatchery. The transport vehicle was met at the front gate, and egg tubes were removed from egg coolers and placed in clean and tempered egg coolers containing 100 ppm Argentyne solution for 10 minutes. The clean egg coolers were then taken to the incubation room, eggs placed into Heath egg trays with approximately 5,400 eggs per basket, and water flows through each stack were set at six gpm. A total of 911,153 eggs were received (Appendix M). We had an excessive loss of eggs from the first egg take (egg take eight) we received from DNFH. The total loss was 76% (228,938 eggs) from the transfer, and was probably

a result of excessive handling from DNFH and Clearwater Fish Hatchery. The egg receiving protocol has been changed to avoid this in the future.

Early Rearing Procedures

Dworshak BY94 North Fork Stock:

In August 1994, 136,603 fish were taken out of the one-year rearing cycle and placed on a two-year cycle. These fish remained in the vat room until June 1995. When they were moved to chinook raceways 9 and 10 (A&B). At the end of early rearing these fish were 22.5 fish per pound or five inches in length. These fish were in excess of stocking requirements for spring 1996.

Bioproducts starter and grower feeds were used to feed these fish during early rearing, in which 6,502 pounds of feed was used to achieve a feed conversion of 1:1.

These fish were raised with and identically to the BY94 smolts that were out planted in the spring of 1995.

BY94 Selway/North Fork Stock:

At swim-up, unfed fry were placed in vats 50 through 56 according to loading charts provided by NBS. Two of the vats were all wild, two were all hatchery, and two were hatchery/wild mix and one was all wild with wrong genotype (AB). Average fish size at the end of early rearing was 17.1 fish per pound or 6.26 inches in length.

Bioproducts starter and Biodiet grower were used to feed these fish during early rearing, in which 3,129 pounds of feed were used to achieve a conversion of 1.02.

Dworshak BY96 North Fork stock:

At swim-up, unfed fry from DNFH stock B-run steelhead were moved to vats 1 through 18 and were divided as evenly as possible (40,000 fish/vat). The initial DI was 0.10 and FI was 0.54. Fish were held in the hatchery vats until October 1995 when they were moved to ten steelhead raceways (8 through 12 east and west). Average length of the fish at the end of early rearing was 4.34 inches. The fish averaged 35 fish per pound.

Water temperatures for the early rearing period ranged from 44°F to 59° F (Appendix O). Whenever the temperatures exceeded 57°F for more than two days, the water was cooled down by either blending in more secondary water or by lowering the primary intake in Dworshak Reservoir.

Bioproduct's starter and Biodiet grower were used to feed these fish during the early rearing period, in which 25,052 pounds of feed was used to achieve a feed conversion of 1.4.

Final Rearing Procedures

Dworshak BY94 North Fork stock:

These fish were moved outside in June 1995 and were ad-clipped in October 1995. Density index ranged from 0.09 to 0.27 and the flow index ranged from 0.25 to 0.93.

There were 165,837 BY94 fish kept in chinook raceway 10A, 10 B, 9A, and 9B for a two-year rearing study.

Fish were fed Rangen's dry feed during final rearing. A total of 28,391 pounds of feed was used during final rearing to produce 21,909 pounds of fish at a cost of $7,665.57. The overall conversion rate from fry-to-smolt was 1.6 (Appendix J). Fish were fed on a week-on, week-off feeding program until one month prior to release when they were fed daily.

Selway/North Fork BY94 stock:

The juvenile Selway/North Fork stock steelhead were moved to outside steelhead raceways one through three east and west and four west through from September 11 through September 12, 1995. The fish were given a LV clip also as they were moved outside. Density index ranged from 0.056 to 0.125 and flow index ranged from 0.097 and 0.167.

A total of 9,154 pounds of feed was used during final rearing to produce 6,993 pounds of fish at a cost of $7,492.63. Fish were fed week-on, week-off until approximately one month prior to release, at which time they were fed every day. The overall conversion rate from fry to smolt was 1.76 (Appendix J).

Dworshak BY95 North Fork Stock:

The juvenile DNFH stock B-run steelhead were moved from vats one through 36 to steelhead raceways 8 through 12 east and west. The move outside was done during the period from September 12 to October 19, 1995. The move was done in conjunction with fin-clipping and CWT tagging to avoid double stressing the fish. All fin-clipping was achieved in 10-hour shifts. Baffles were removed from vats, fish were then moved to the clipping trailers using a four-inch fry pump. A portion of the fish were clipped through a portable ad-clipping table, loaded into 200 gallon tanks, and transported to the raceways (Appendix P).

The DI of the DNFH steelhead ranged from 0.10 to 0.24, and the Fl ranged from 0.54 to 0.96. These indexes were recalculated biweekly and were never allowed to exceed DI of 0.3 or FI of 1.2.

Water temperatures during final rearing period were maintained to keep temperatures as close to 57°F as possible. Reservoir water temperatures began to drop in late October and bottomed out in February 1996 at 36°F. Temperatures began to slowly increase in early March and had reached 49°F by April 1996 (Appendix O). Estimated water flows per raceway was 2.8 cfs.

Fish were fed dry feed until released. Raceway 12 east and west used extruded pellets to determine how well it would work in the steelhead feeders, as well as pallet ability of the feed. Boards were placed at the surface every 25 feet to prevent the feed from floating into the screen.

The feed was palatable to the fish and was available throughout the day. This feed will be studied in the future. A total of 100,068 pounds of feed was used during final rearing to produce 78,546 pounds of fish at a cost of $27,018.36. The overall conversion rate from fry to smolt was 1.6. The percent body weight fed ranged from 0.7 to 6.5% (Appendix J).

Fish Health

The steelhead reared at Clearwater Fish Hatchery were relatively problem free. No treatments were applied (Appendix Q).

Fish Marking

Dworshak BY94 North Fork Stock:

A total of 136,372 of these fish received Ad-clips only with 300 PITs (Appendix P).

Selway BY94 Stock:

A total of 46,018 fish received LV clips and 1,800 PITS. A small group of 6,354 fish received also received LV clips but were released in different location (Appendix P).

Dworshak BY95 North Fork Stock:

All North Fork stock steelhead released into the South Fork of the Clearwater River, and Clear Creek were all marked with AD clips. Of the 47,226 North Fork stock steelhead which were released into the South Fork of Red River, 4,089 received PITs, 43,137 CWTs, and no ad-clips. Each of these groups contained a number of PITs and CWTs (Appendix P). Another group of 8,000 fish, all ad-clipped and tagged with 4,000 PITs, was released in the spring of 1996.

Fish Distribution

Dworshak BY94 North Fork Stock:

On April 19, 1996 135,837 smolts were transported to Kooskia Hatchery and released into Clear Creek. These fish were reared in a two-year rearing cycle. They were 6.2 fish per pound and averaged 190 mm at release (Appendix P).

Selway/North Fork BY94 Stock:

These fish were reared for a NBS research project. They have also been raised in a two-year rearing cycle. A total of 46,018 fish were transported to Crooked River raceways for a two-week acclimation period and then released. A group of 6,354 smolts were transported to the North Fork of Red River and direct released into the stream. They were released into Red River instead of Crooked River because they were the wrong genotype for the research project. The fish released at Crooked River were an average of 177 mm and 7.5 fish per pound for a total of 6,135 pounds. The fish released at Red River were an average of 179 mm and 7.4 fish per pound for a total of 858 pounds (Appendix P).

A shipment of BY94 and BY95 Selway/North Fork stock steelhead were transported to the NBS in Seattle, Washington. There were 150 BY94 and 94 BY95 fish in this shipment.

Dworshak BY95 North Fork stock:

A total of 603,118 fish were liberated between April 17 and 19, 1996. A total of 432,513 DNFH B-run steelhead were direct released at three plant sites on the lower South Fork of Clearwater River. These include 121,290 (7.4 per pound) at the mouth of Cottonwood Creek, 126,009 (7.6 per pound) upstream from the town of Stites at milepost 18, and 185,214 (7.5 per pound) at Red House Hole (approximately 3.5 miles upstream of Highway 14 junction). The remaining 162,605 (8.6 per pound) DNFH B-run steelhead were direct released into Clear Creek at Kooskia Hatchery on the Middle Fork of the Clearwater River (Appendix P).

A total of 47,226 North Fork B-run steelhead were released as pre-smolts in the South Fork of Red River on September 6, 1995. Size at release was 57.9 fish per pound. An additional 8,000 North Fork stock were released into the South Fork of Red River as full-term smolts (Appendix P).

ACKNOWLEDGMENTS

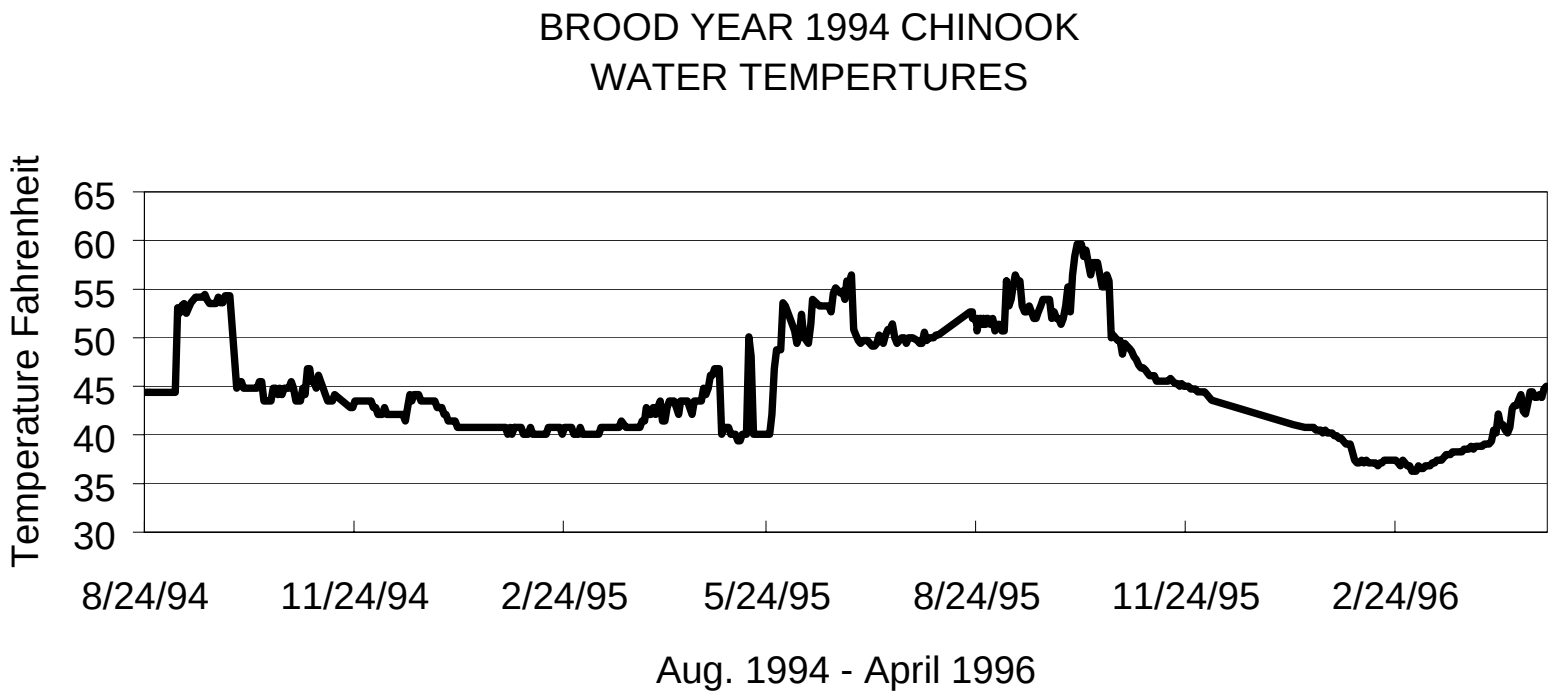
The Clearwater Fish Hatchery has a crew of 27 people and are all assigned a wide diversity of responsibilities. Everyone on station has contributed to the success of the program. The hatchery crew consists of: Jerry McGehee (Fish Hatchery Manager II), Brad George, Scott Patterson (Assistant Fish Hatchery Managers), John Rankin, CalLee Davenport, Bob Turik (Fish Culturists), Ernie Yost (Utility Craftsman), Rene'e Hedrick (Office Secretary), Don Davis, Ric Downing, and Don West (Fish Technicians), Dave Robertson, Chris Shockman, Josh Jones, Jeff Houck, Bob Nelson, Jim Niles, Jeremy Olson, Brian Spence, Tim Snyder, Kim West, and John Zakrajsek, (Bio-aides), Dave Rising (Grounds Maintenance Worker), Tony Demitter, Josh Downing (Laborers), and Chris Estrada (Assistant Mechanic).

Chris Shockman and Jim Niles have been promoted to Fisheries Technician to replace Don West and Don Davis.

Special acknowledgment goes to Ernie Yost, Utility Craftsman, and Don West, Ric Downing and Don Davis, Fisheries Technicians, whose work was critical in getting the physical and mechanical aspects of the fish hatchery and satellites to function; Dave Robertson for analyzing and reporting size of smolt and micro nutrients research information; Brad George and Scott Patterson, Assistant Managers; John Rankin, Fish Culturist's, who helped with editing of this report; and especially to Rene'e Hedrick for her persistence in completion of this report during the typing and editing process.

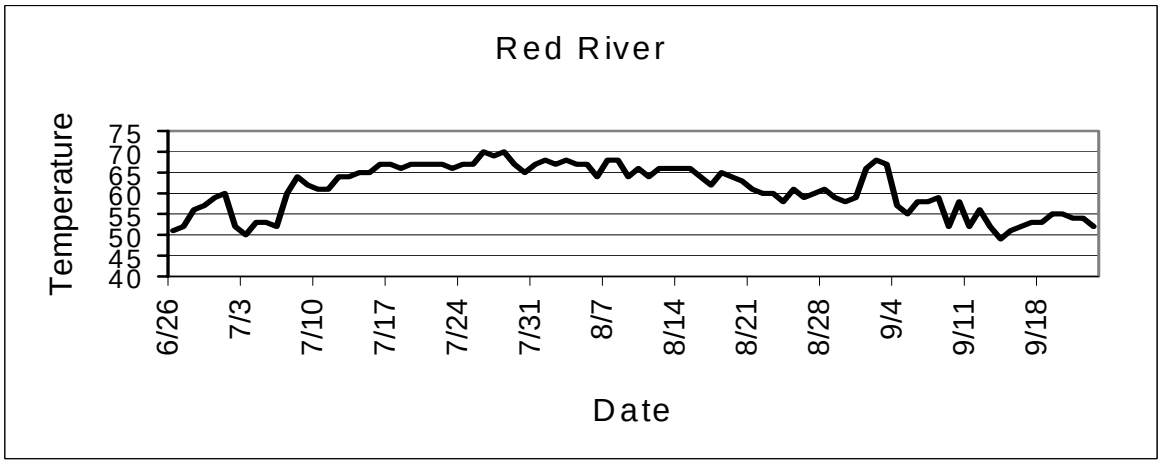
APPENDICES

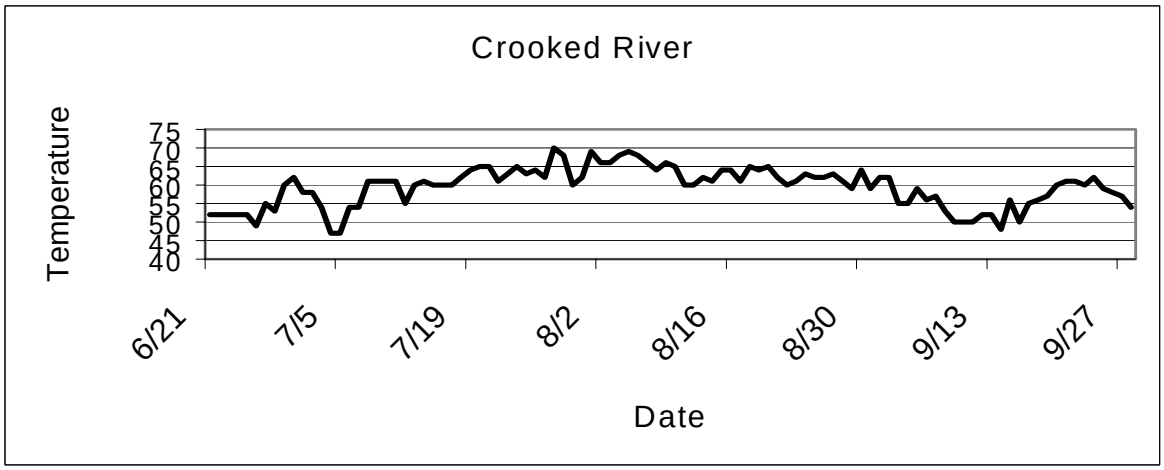
Appendix A.1 Chinook Water Temperatures, Brood Year 1994

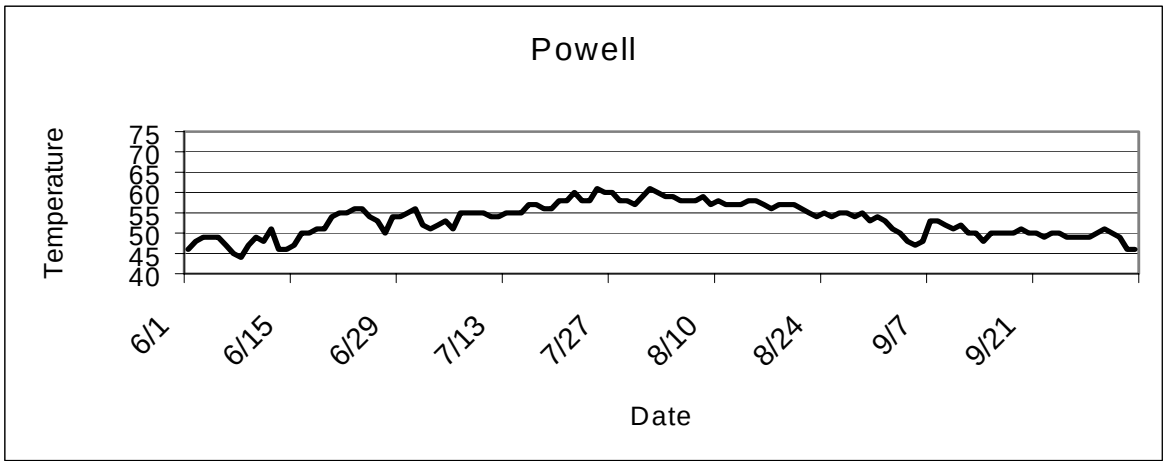


Incubation Aug. 94 – Dec. 94 Early Rearing Dec. 94 – June 95 Chinook Raceways June 95 – April 96

Appendix A.2 Mean Water Temperatures for Satellites for Brood Year 1994.







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Appendix B.1. Clearwater Fish Hatchery Water Quality Analysis Taken From The Hatchery Rearing Facility On August 4, 1994.

Analysis	Results (Mg/L)	Date Analyzed	Optimal Rearing Levels
Alkalinity	16.0	08/04/94	120 - 400 mg/l
Ammonia (as N)	<0.005	08/04/94	0.0125
Arsenic	<0.01	08/04/94	N/A
Barium	<0.1	08/04/94	N/A
Cadmium	<0.001	08/04/94	<.0004 mg/l
Calcium	3.8	08/12/94	N/A
Chloride	0.9	08/12/94	N/A
Chromium	<0.01	08/04/94	0.1
Color (C.U.)	15	08/12/94	N/A
Copper	<0.02	08/04/94	<.006 mg/l
Cyanide	<0.005	08/12/94	N/A
Detergents(surfactant	<0.08	08/09/94	N/A
Fluoride	<0.1	08/30/94	N/A
Hardness	14.0	08/04/94	120 - 400 mg/l
Hydrogen Sulfide	<0.01	08/15/94	N/A
Iron	<0.02	08/11/94	N/A
Lead	<0.005	08/04/94	<.03 mg/l
Magnesium	<0.8	08/11/94	N/A
Manganese	<0.01	08/11/94	N/A
Mercury	<0.0005	08/11/94	<.002 mg/l
Nitrogen Nitrate	<0.013	08/18/94	0.2 mg/l
Potassium	0.5	08/12/94	N/A
Selenium	<0.005	08/10/94	N/A
Silica	11	08/30/94	N/A
Silver	<0.001	08/17/94	N/A
Sodium	1.5	08/17/94	N/A
Sulfate	<1	08/26/94	N/A
Total DissolvedSolids	28	08/11/94	80 mg /l
Zinc	<0.005	08/10/94	0.03 mg/l
pH (pH units)	7.20	08/09/94	6.5 - 8.0

Appendix B.2. Red River Facility Water Quality Analysis Taken From The Rearing Intake On July 20, 1994.

Analysis	Results (Mg/L)	Date Analyzed	Optimal Rearing Levels
Alkalinity	16.0	07/29/94	120 - 400 mg/l
Aluminum	100 ug/l	08/04/94	N/A
Ammonia	0.016 ug/l	08/04/94	0.0125 mg / l
Arsenic	<10 ug/l	08/04/94	N/A
Barium	<100 ug/l	08/01/94	N/A
Cadmium	<1 ug/l	08/02/94	<.0004 mg/l
Calcium	3.0	08/04/94	N/A
Chloride	1.1	08/05/94	N/A
Chromium	<10	08/03/94	0.1
Color (C.U.)	15 c.u.	07/28/94	N/A
Copper	<20 ug/l	08/01/94	<.006 mg/l
Cyanide	<0.005	07/27/94	N/A
Detergents(surfactant	<0.08	08/08/94	N/A
Filterable Residue	43	07/25/94	N/A
Fluoride	<0.1	07/28/94	N/A
Hardness	18.0	08/04/94	120 - 400 mg/l
Hydrogen Sulfide	<0.01	07/26/94	N/A
Iron	<170 ug/l	08/01/94	N/A
Lead	<5 ug/l	08/02/94	<.03 mg/l
Magnesium	<0.6	08/11/94	N/A
Manganese	<10	08/01/94	N/A
Mercury	<0.5 ug/l	08/04/94	<.002 mg/l
Nitrate	0.007	08/04/94	0.03-.0.06
Potassium	0.5	08/12/94	N/A
Selenium	<5 ug/l	08/01/94	N/A
Silica	17	08/30/94	N/A
Silver	<1 ug/l	08/01/94	N/A
Sodium	3.0	08/01/94	N/A
Sulfate	<1	07/29/94	N/A
Zinc	<5 ug/l	08/01/94	0.03 mg/l
pH (pH units)	7.63	08/09/94	6.5 - 8.0

Appendix B.3. Crooked River Water Quality Analysis Taken From The Rearing Intake On July 14, 1994.

Analysis	Results (Mg/L)	Date Analyzed	Optimal Rearing Levels
Alkalinity	15.0	07/29/94	120 - 400 mg/l
Aluminum	0.2	08/04/94	N/A
Ammonia	0.61	08/04/94	0.0125 mg / l
Arsenic	<0.01	08/04/94	N/A
Barium	<0.1	08/01/94	N/A
Cadmium	<0.001	08/02/94	<.0004 mg/l
Calcium	3.2	08/04/94	N/A
Chloride	0.9	07/22/94	N/A
Chromium	<0.01	07/27/94	N/A
Color (C.U.)	15	07/28/94	N/A
Copper	<0.02	08/01/94	<.006 mg/l
Cyanide	<0.005	07/27/94	N/A
Detergents(surfactant	<0.08	08/08/94	N/A
Total dissolved solids	38	07/25/94	N/A
Fluoride	<0.1	07/28/94	N/A
Hardness	14.0	08/04/94	120 - 400 mg/l
Hydrogen Sulfide	<0.010	07/26/94	N/A
Lead	<.0005	08/02/94	<.03 mg/l
Magnesium	<0.06	08/11/94	N/A
Manganese	<0.60	08/01/94	N/A
Mercury	<0.0005	08/04/94	<.002 mg/l
Nitrogen	0.13	08/04/94	0.03-.0.06
Potassium	0.4	08/12/94	N/A
Selenium	<.005	08/01/94	N/A
Silica	14.6	08/30/94	N/A
Silver	<.001	08/01/94	N/A
Sodium	2.4	08/01/94	N/A
Sulfate	<1	07/29/94	N/A
Zinc	<.005	08/01/94	0.03 mg/l
pH (pH units)	7.37	08/09/94	6.5 - 8.0

Appendix B.4 Powell Facility Water Quality Analysis Taken From The Intake Rearing On July 27, 1994.

Analysis	Results (Mg/L)	Date Analyzed	Optimal Rearing Levels
Alkalinity	24.0	07/29/94	120 - 400 mg/l
Aluminum	0.1	08/04/94	N/A
Ammonia	0.047	08/04/94	0.0125 mg / l
Arsenic	<0.01	08/04/94	N/A
Barium	<0.1	08/01/94	N/A
Cadmium	<0.001	08/02/94	<.0004 mg/l
Calcium	6.3	08/04/94	N/A
Chloride	1.1	07/22/94	N/A
Chromium	<0.01	07/27/94	N/A
Color (C.U.)	15	07/28/94	N/A
Copper	<.02	08/01/94	<.006 mg/l
Cyanide	<0.005	07/27/94	N/A
Detergents(surfactant	<0.08	08/08/94	N/A
Total dissolved solids	37	07/25/94	N/A
Fluoride	<0.1	07/28/94	N/A
Hardness	22.0	08/04/94	120 - 400 mg/l
Hydrogen Sulfide	<0.016	07/26/94	N/A
Lead	<0.0055	08/02/94	<.03 mg/l
Magnesium	<1.1	08/11/94	N/A
Manganese	<0.10	08/01/94	N/A
Mercury	<0.005	08/04/94	<.002 mg/l
Nitrogen	0.043	08/04/94	0.03-.0.06
Potassium	0.5	08/12/94	N/A
Selenium	<.005	08/01/94	N/A
Silica	15	08/30/94	N/A
Silver	<.001	08/01/94	N/A
Sodium	2.2	08/01/94	N/A
Sulfate	<1	07/29/94	N/A
Zinc	<.005	08/01/94	0.03 mg/l
pH (pH units)	7.33	08/09/94	6.5 - 8.0

A positive Langlier index indicates a tendency of water to deposit calcium carbonate and a negative index indicates a tendency to dissolve calcium carbonate. This index is not related directly to corrosion but to the deposition of a thin coherent scale, which may be protective. Therefore, a slightly positive index is frequently associated with non-corrosive conditions and a negative index indicates the possibility of corrosion.

Appendix C. Egg Inventory Information and Percent Eye-up.

Powell

Lot Number	Date Spawned	Number Of Females	Net Egg Numbers	Eggs Per Female	Number Eyed Eggs	Percent Eye-Up
1	08/01	2	10,310	5,155	7,312	70.9
2	08/08	2	7,245	3,623	5,608	77.4
3	08/11	3	14,675	4,892	13,766	93.8
4	08/15	9	42,370	4,708	40,699	96.1
5	08/18	8	37,395	4,674	36,224	96.9
6	08/22	13	65,362	5,028	63,946	97.8
7	08/25	9	43,144	4,794	41,565	96.3
8	08/29	8	31,544	3,943	28,543	90.5
Totals		54	252,045	4,668	237,663	94.3

Crooked River

Lot Number	Date Spawned	Number Of Females	Net Egg Numbers	Eggs Per Female	Number Eyed Eggs	Percent Eye-Up
1	08/23	1	4,558	4,558	4,070	89.3
2	08/26	1	3,033	3,033	2,795	92.2
3	08/30	5	24,708	4,942	22,596	91.5
4	09/02	1	4,761	4,761	4,121	86.6
5	09/06	1	4,341	4,341	3,332	76.8
6	09/09	1	3,005	3,005	2,102	70.0
Totals		10	44,406	4,441	39,016	87.9

Red River

Lot Number	Date Spawned	Number Of Females	Net Egg Numbers	Eggs Per Female	Number Eyed Eggs	Percent Eye-Up
1	08/19	1	5,031	5,031	2,861	56.9
2	08/26	2	8,774	4,387	8,061	91.9
3	08/30	3	12,199	4,066	11,379	93.3
4	09/02	1	4,630	4,630	4,520	97.6
Totals		7	30,634	4,376	26,821	87.6

Rapid River

Lot Number	Number Of Females	Number Eyed Eggs
1	1	5,261
2	2	7,543
3	1	3,717
4	3	14,887
5	6	20,181
6	2	4414
7	1	2,088
TOTALS	16	58,091

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Appendix D.1 Red River Chinook Length Frequencies

Length (Cm)	Male	Female
60	1	
61		
62		
63		
64		
65		
66		
67		
68		1
69		
70		
71	1	1
72		1
73	1	2
74		1
75	3	1
76	2	
77	2	2
78		
79		2
80		2
81	1	4
82		1
83	1	1
84	2	5
85		4
86	2	7
87	2	6
88	2	5
89		3
90	1	3
91	3	
92	2	2
93		
94		
95	2	1
96		
97	2	
98		
99	1	
TOTAL	31	55

Appendix D.2. Crooked River Chinook Length Frequencies.

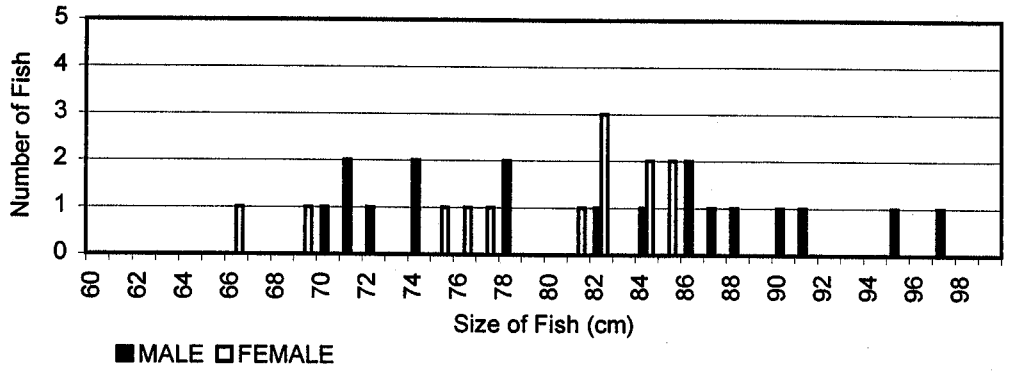
Length (Cm)	Male	Female
60		1
61		
62		
63		
64		1
65		
66		
67		
68		
69		
70		
71		
72		
73		1
74		
75		
76		1
77		1
78		1
79		
80	1	3
81	1	4
82		1
83	1	
84		1
85		1
86		2
87		
88	1	
89	1	
90		
91	1	
92		
93		
94		
95		
96	1	
97		
98		
99		
100		
101		
102		
103		
104		
105	1	
TOTAL	8	18

Appendix D.3 Powell Chinook Length Frequencies.

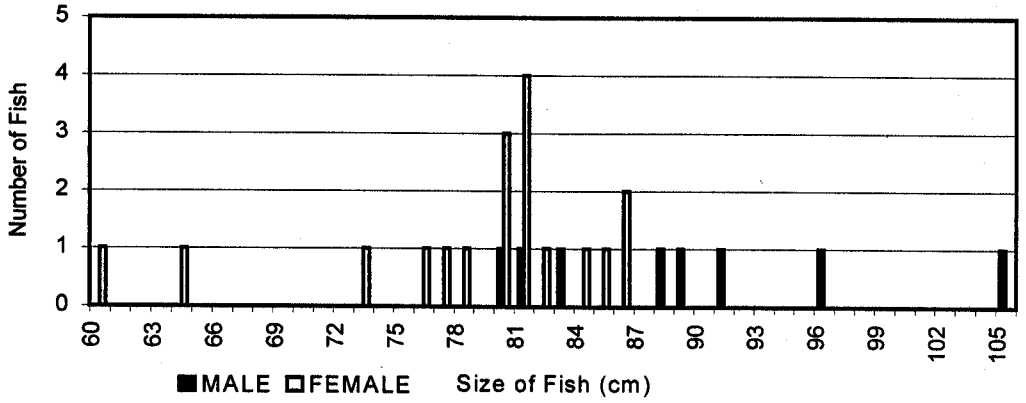
Length (Cm)	Male	Female
60		
61		
62		
63		
64		
65		
66		1
67		
68		
69		1
70	1	
71	2	
72	1	
73		
74	2	
75		1
76		1
77		1
78	2	
79		
80		
81		1
82	1	3
83		
84	1	2
85		2
86	2	
87	1	
88	1	
89		
90	1	
91	1	
92		
93		
94		
95	1	
96		
97	1	
98		
99		
TOTAL	18	13

Appendix D.4 By94 Chinook Length Graph for Red River, Crooked River and Powell.

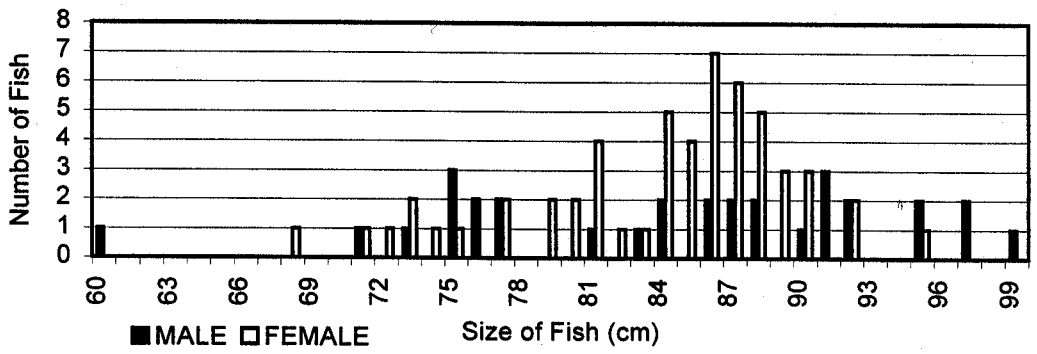
Red River



Crooked River



Powell



Appendix E.1 Red River Run Timing

Date	Male	Female	Total
06/01/94	0	0	0
06/02/94	0	1	1
06/03/94	0	0	0
06/04/94	0	0	0
06/05/94	0	0	0
06/06/94	0	0	0
06/07/94	0	0	0
06/08/94	0	0	0
06/09/94	0	0	0
06/10/94	0	0	0
06/11/94	0	0	0
06/12/94	2	0	2
06/13/94	1	1	2
06/14/94	1	0	1
06/15/94	2	0	2
06/16/94	0	0	0
06/17/94	0	1	1
06/18/94	0	0	0
06/19/94	1	1	2
06/20/94	1	1	2
06/21/94	4	0	4
06/22/94	0	1	1
06/23/94	0	0	0
06/24/94	0	0	0
06/25/94	0	2	2
06/26/94	0	0	0
06/27/94	0	0	0
06/28/94	0	0	0
06/29/94	0	0	0
06/30/94	0	0	0
07/01/94	0	0	0
07/02/94	0	0	0
07/03/94	0	0	0
07/04/94	0	0	0
07/05/94	0	0	0
07/06/94	0	0	0
07/07/94	0	0	0
07/08/94	0	0	0
07/09/94	0	1	1
07/10/94	0	1	1
07/11/94	0	0	0
07/12/94	0	0	0
07/13/94	0	1	1
07/14/94	0	0	0
07/15/94	0	0	0
07/16/94	0	0	0
07/17/94	0	0	0
07/18/94	0	0	0
07/19/94	0	0	0
07/20/94	0	0	0
07/21/94	0	0	0
07/22/94	0	0	0
07/23/94	1	0	1
07/24/94	0	1	1
07/25/94	1	0	1
07/26/94	1	1	2
07/27/94	0	0	0
07/28/94	0	0	0
07/29/94	0	0	0
07/30/94	0	0	0
07/31/94	0	0	0
08/01/94	0	0	0
08/02/94	0	0	0
08/03/94	0	0	0
08/04/94	0	0	0
08/05/94	0	0	0
08/06/94	0	0	0
08/07/94	0	0	0
08/08/94	0	0	0
08/09/94	0	0	0
08/10/94	0	0	0
08/11/94	0	0	0
08/12/94	0	0	0
08/13/94	0	0	0
08/14/94	0	0	0
08/15/94	0	0	0
08/16/94	0	0	0
08/17/94	0	0	0
08/18/94	0	0	0
08/19/94	0	0	0
08/20/94	0	0	0
08/21/94	1	0	1
08/22/94	0	0	0
08/23/94	1	0	1
08/24/94	0	0	0
08/25/94	0	0	0
08/26/94	0	0	0
08/27/94	0	0	0
08/28/94	0	0	0
08/29/94	0	0	0
08/30/94	0	0	0
08/31/94	0	0	0
09/01/94	0	0	0
09/02/94	0	0	0
09/03/94	0	0	0
09/04/94	0	0	0
09/05/94	1	0	1
Total	18	13	31

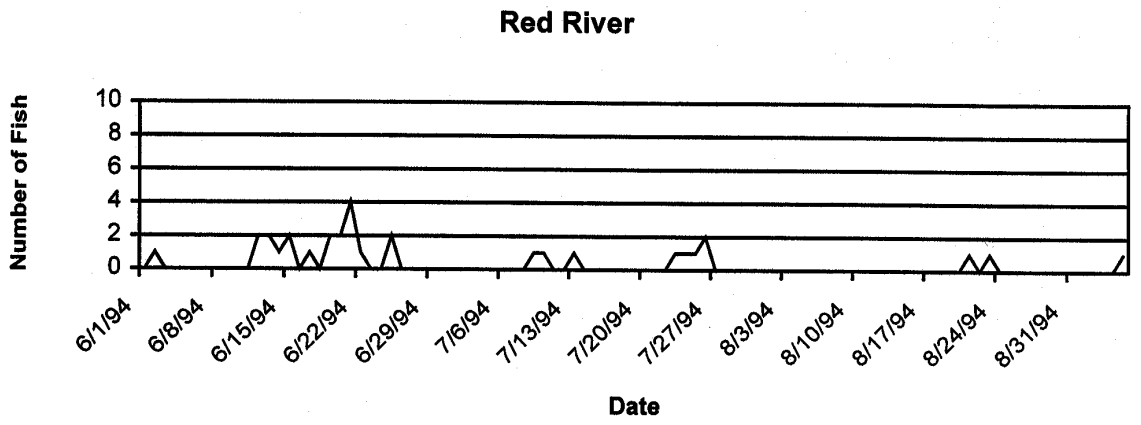
Appendix E.2 Crooked River Run Timing.

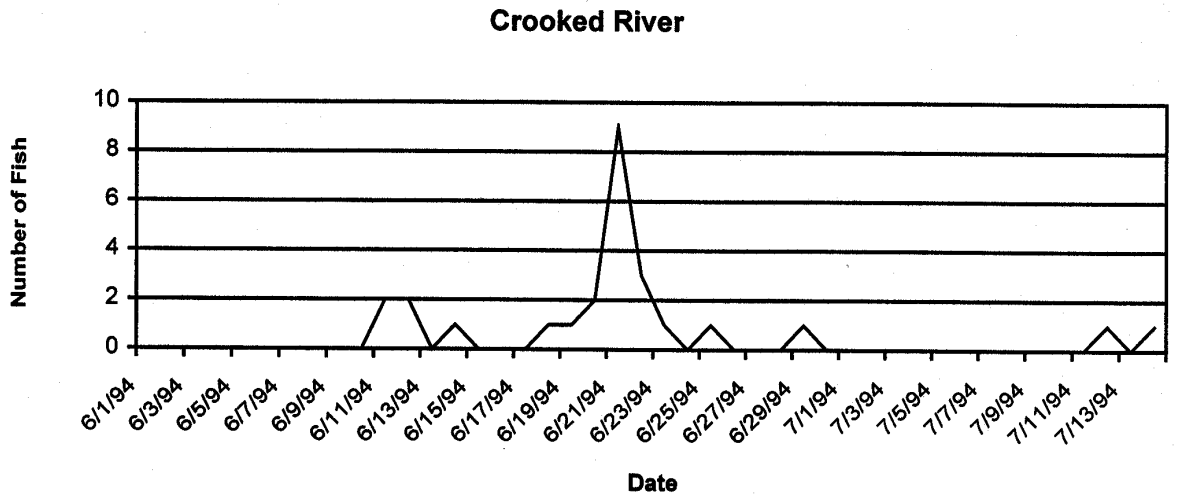
Date	Male	Female	Total
06/01/94	0	0	0
06/02/94	0	0	0
06/03/94	0	0	0
06/04/94	0	0	0
06/05/94	0	0	0
06/06/94	0	0	0
06/07/94	0	0	0
06/08/94	0	0	0
06/09/94	0	0	0
06/10/94	0	0	0
06/11/94	0	2	2
06/12/94	1	1	2
06/13/94	0	0	0
06/14/94	1	0	1
06/15/94	0	0	0
06/16/94	0	0	0
06/17/94	0	0	0
06/18/94	0	1	1
06/19/94	0	1	1
06/20/94	0	2	2
06/21/94	4	5	9
06/22/94	2	1	3
06/23/94	0	1	1
06/24/94	0	0	0
06/25/94	1	0	1
06/26/94	0	0	0
06/27/94	0	0	0
06/28/94	0	0	0
06/29/94	0	1	1
06/30/94	0	0	0
07/01/94	0	0	0
07/02/94	0	0	0
07/03/94	0	0	0
07/04/94	0	0	0
07/05/94	0	0	0
07/06/94	0	0	0
07/07/94	0	0	0
07/08/94	0	0	0
07/09/94	0	0	0
07/10/94	0	0	0
07/11/94	0	0	0
07/12/94	0	1	1
07/13/94	0	0	0
07/14/94	1	0	1
	10	16	26

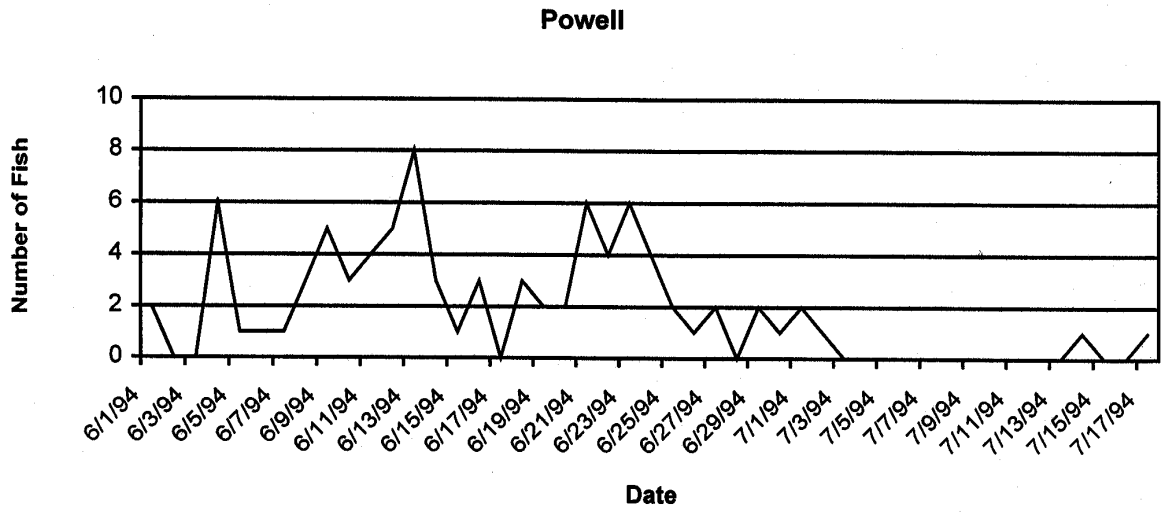
Appendix E.3. Powell Satellite Run Timing

Date	Male	Female	Total
06/01/94	1	1	2
06/02/94	0	0	0
06/03/94	0	0	0
06/04/94	3	3	6
06/05/94	1	0	1
06/06/94	0	1	1
06/07/94	1	0	1
06/08/94	2	1	3
06/09/94	2	3	5
06/10/94	1	2	3
06/11/94	1	3	4
06/12/94	3	2	5
06/13/94	5	3	8
06/14/94	2	1	3
06/15/94	1	0	1
06/16/94	1	2	3
06/17/94	0	0	0
06/18/94	3	0	3
06/19/94	0	2	2
06/20/94	1	1	2
06/21/94	4	2	6
06/22/94	1	3	4
06/23/94	4	2	6
06/24/94	1	3	4
06/25/94	2	0	2
06/26/94	0	1	1
06/27/94	1	1	2
06/28/94	0	0	0
06/29/94	1	1	2
06/30/94	0	1	1
07/01/94	1	1	2
07/02/94	0	1	1
07/03/94	0	0	0
07/04/94	0	0	0
07/05/94	0	0	0
07/06/94	0	0	0
07/07/94	0	0	0
07/08/94	0	0	0
07/09/94	0	0	0
07/10/94	0	0	0
07/11/94	0	0	0
07/12/94	0	0	0
07/13/94	0	0	0
07/14/94	1	0	1
07/15/94	0	0	0
07/16/94	0	0	0
07/17/94	1	0	1
Total	45	41	86

Appendix E.4 Red River, Crooked River, and Powell Chinook Run Timing Graph.







Appendix F.1 Fish Disposition, Red River Trap.

Total Fish Trapped: 31

Age Classes		Females	Males
3 Years =	(< 64 Cm)	0	0
4 Years =	(64 - 82 Cm)	9	9
5 Years =	(> 83 Cm)	4	9
		13	18

Fish Disposition Females:

Spawned	7	
Released	5	
Mortality	1	
Total	13	

Fish Disposition Males:

Spawned	8	Adults
Released	10	Adults
Mortality	0	
Total	18	

All spawning carcasses were hauled to local landfill as per INAD protocol

Appendix F.2. Fish Disposition, Crooked River Trap.

Total Fish Trapped: 26

Age Classes		Females	Males
3 Years =	(< 64 Cm)	1	0
4 Years =	(64 - 82 Cm)	13	2
5 Years =	(> 83 Cm)	4	6
		18	8

Fish Disposition Females:

Spawned	10	
Released	6	
Mortality	2	
Total	18	

Fish Disposition Males:

Spawned	2	Adults
Released	5	Adults *
Mortality	1	Adults
Total	8	

*All Males Were Spawned Prior To Release.

All spawning carcasses were hauled to local landfill as per INAD protocol

Appendix F.3 Fish Distribution, Powell Trap.

Total Fish Trapped: 86

Age Classes		Females	Males
3 Years =	(< 64 Cm)	0	1
4 Years =	(64 - 82 Cm)	18	10
5 Years =	(> 83 Cm)	37	20
		55	31

Fish Disposition Females:

Spawned	54	
Released	0	
Mortality	1	
Total	55	

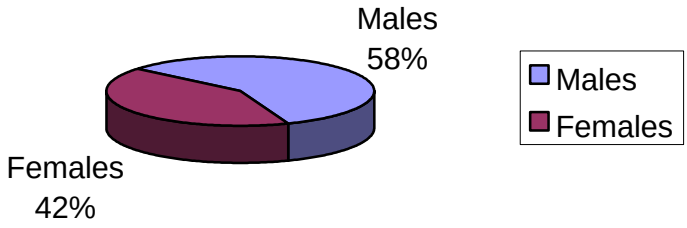
Fish Disposition Males:

Spawned	29	Adults
Released	0	
Mortality	2	1 Adults, 1 Jack
Total	31	

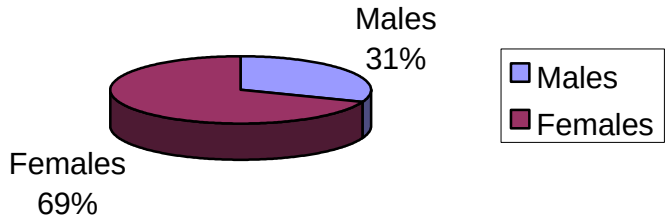
All spawning carcasses were hauled to local landfill as per INAD protocol

Appendix G. Spring Chinook Salmon Run Composition, Red River, Crooked River, and Powell.

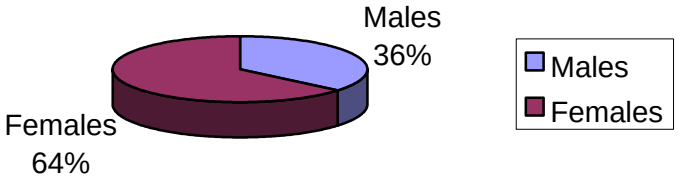
Red River



Crooked River



Powell



Appendix H. BY93 Chinook Marking and Tagging.

Full Term Smolts

Site	Date	Mark	CWT	PIT	Number	Fpp	Length (mm)
Hells Canyon	04/09/96	AD	None	None	67,818	12.4	141
Crooked River	04/10/96	AD	None	2,100	37,071	17.9	131
Red River	04/10/96	RV	None	1,214	24,002	19.0	130
Powell	04/11/96	AD	129,096	11,420	221,191	17.7	132
Powell (high bkd)	04/15/96	AD	None	None	11,540	15.8	140
		Total			361,622		

Appendix I.1. Summary of Chinook Returns to Red River by Brood Year.

Brood Year	Year released	Number released	3-yr olds	Year returned	4-yr olds	Year returned	5-yr olds	Year returned	Total BY return	% return from plant
1982	Fall 1983	260,000	2	1985	[a]	1986	107	1987	109	0.036%
	Spr 1984	40,000								
1983	Spr 1985[b]	80,000	[a]	1986	377	1987	259	1988	636	0.795%
1984	Spr 1986[b]	136,800	35	1987	132	1988	74	1989	241	0.176%
1985	Fall 1986[c]	96,400	3	1988	25	1989	13	1990	41	0.021%
	Spr 1987[c]	96,800								
1986	Fall 1987	233,100	5	1989	38	1990	8	1991	51	0.022%
1987	Fall 1988	291,200	2	1990	9	1991	3	1992	14	0.005%
1988	Fall 1989	240,500	1	1991	31	1992	39	1993	71	0.029%
1989	Fall 1990	273,800	5	1992	99	1993	13	1994	117	0.025%
1989	Spr 1991[d]	63,000								
1989	Spr 1991[e]	124,000								
		460,800								
1990	Fall 1991	354,700	1	1993	18	1994	1	1995	20	0.004%
1990	Spr 1992[f]	207,500								
		562,200								
1991	Fall 1992	6,000	0	1994	0	1995		1996	0	0.000%
1992	Fall 1993	22,246	3	1995		1996		1997	0	0.013%
1993	Fall 1994	320,755		1996		1997		1998		
1994	Spr 1996	24,002		1997		1998		1999		

[a]Trap was not installed in 1986 due to construction.
[b]These fish wintered in the rearing pond.
[c]These fish were Rapid River stock reared at Sawtooth and released directly into Red River with no acclimation.
[d]Planted off bridge at ranger station, reared at Dworshak National Fish Hatchery, Clearwater stock.
[e]Planted off bridge at ranger station, reared at Kooskia, Clearwater stock.
[f]Acclimated in rearing pond for 21 days, transferred from Dworshak.

Appendix I.2. Summary of Chinook Returns to Crooked River by Brood Year.

Brood Year	Year released	Number released	3-yr olds	Year returned	4-yr olds	Year returned	5-yr olds	Year returned	Total BY return	% return from plant
1985	----	----	----	1988	----	1989	4	1990	4	ERR
1986	----	----	----	1989	23	1990	5	1991	28	ERR
1987	Spr 1989[a]	199,700	2	1990	13	1991	7	1992	22	0.011%
1988	Spr 1990[b]	300,407	2	1991	208	1992	276	1993	486	0.162%
1989	Fall 1990[c]	339,087	13	1992	119	1993	10	1994	142	0.042%
1990	Fall 1991[a]	320,400	7	1993	15	1994	0	1995	22	0.002%
1991	**----**	**----**	**1***	**1994**	**0**	**1995**		**1996**	**1**	**0.000%**
1992	Spr 1994[d]	273,766	6	1995		1996		1997	6	0.002%
1993	Fall 1994[e]	415,535		1996		1997		1998	0	0.000%
	Spr 1995	258,293								
	Spr 1995[ef]	279,615								
		953,443								
1994	Spr 1996	37,071		1997		1998		1999		

[a]Transferred from Dworshak Hatchery.
[b]Direct release from Kooskia Fish Hatchery.
[c]Transferred from Dworshak and Rapid River hatcheries.
[d]Eggs from Looking Glass Hatchery (Rapid River stock) reared at Clearwater Fish Hatchery
[e]Eggs from Rapid River hatchery reared at Clearwater Fish Hatchery
[e]Non-acclimated release
*Natural Fish

Appendix I.3. Summary of Chinook Returns to Powell by Brood Year.

Brood Year	Year released	Number released	3-yr olds	Year returned	4-yr olds	Year returned	5-yr olds	Year returned	Total BY return	% return from plant
1984	Spr 1986			1987		1988	16	1989	16	ERR
1985	Spr 1987			1988	111	1989	20	1990	131	ERR
1986	Spr 1988[a]	200,100	27	1989	157	1990	10	1991	194	0.097%
1987	Spr 1989[b]	200,639	2	1990	16	1991	15	1992	33	0.016%
1988	Fall 1989	314,500	7	1991	249	1992	288	1993	544	0.173%
1989	Fall 1990	307,100	6	1992	204	1993	57	1994	267	0.054%
	Spr 1991[c]	180,764								
1990	Fall 1991	358,400	8	1993	28	1994	1	1995	37	0.007%
	Spr 1992[d]	150,800								
	Spr 1992[e]	53,500								
		562,700								
1991	Fall 1992[f]	500	1	1994	1	1995		1996	2	
	Fall 1992[g]									
1992	Spr 1994[h]	144,823	12	1995		1996		1997	12	0.005%
	Spr 1994[i]	61,060								
	Spr 1994[j]	55,745								
		261,628								
1993	Fall 1994	311,690		1996		1997		1998		
	Spr 1995	290,417								
1994	Spr 1996	232,731		1997		1998		1999		

[a]Rapid River stock reared at Dworshak.
[b]Clearwater stock reared at Kooskia and Dworshak.
[c]Clearwater stock reared at Kooskia; acclimated in rearing pond.
[d]Acclimated 21 days in rearing pond before release into Walton Creek, transferred from Dworshak.
[e]Not acclimated, transferred to rearing pond and immediately released.
[f]These smolts were released from the rearing pond to Walton Creek.
[g]Released at headwaters of Crooked Fork Creek
[h]Acclimated 17 days, volitional release 5 days, release in Walton Cr.
[i]Non-acclimated, transferred to rearing pond and immediately released.
[j]Released directly into Walton Creek

Appendix J. BY94 Chinook, by 1994 Selway, B&95 Steelhead Production Cost.

Rearing To Release

	Chinook (BY-94)	Selway (BY-94)	North Fork Steelhead (BY-94)	Steelhead (BY-95)
No. Produced	361,622	52,372	135,837	650,344
Weight	22,019	6,993	21,909	78,546
% Mortality	2%	21%	15.5%	6%
Conversion Rate * week on - week off feeding	*1.57	*1.76	*1.73	1.6

Food Fed And Weight Gained

	Chinook (BY-94)	Selway (BY-94)	North Fork Steelhead (BY-94)	Steelhead (BY-95)
Period Fed	1/20/95 - 4/11/96	6/14/94- 4/11/96	6/1/94 - 4/11/96*	6/5/95- 5/1/96
Feed Used Lbs.	35,348	12,283	35,893	125,120
Weight Gain	21,724	6,960	21,800	78,320
Feed Cost	$28,364.88	$7,492.63	$15,207.89	$49,944.20

Total Feed Cost	$101,009.60
Cost / pound steelhead and chinook	$0.78

- BY-94 steelhead early rearing numbers 6/1/94-6/1/95 were estimated based on size at release and size on 6/1/95

Appendix K. BY93 Chinook Pre-smolt Distribution.

Chinook

Hatchery Clearwater **Year** Spring 1996

Species	Stock	Brood Year	Release Site	Release Date	Number Released	Size No./lb	Length (T.L.)	Pounds	Marks	Number of Marks Released
Spring Chinook	Rapid River	1994	Hells Canyon	04/09/96	67,818	12.4	141 mm	5,473	All Ad	67,818
Spring Chinook	Crooked River	1994	Crooked River	04/10/96	37,071	17.9	131 mm	2,071	All Ad 2,100 PIT	37,071
Spring Chinook	Red River	1994	Red River	04/10/96	24,002	19.0	130 mm	1,264	RV Only 1,214 PIT	24,002
Spring Chinook	Powell (low BKD)	1994	Walton Creek	04/11/96	221,191	17.7	132 mm	12,481	All Ad 120K CWT 11,420 PITS	221,191
Spring Chinook	Powell (high BKD)	1994	Walton Creek	04/15/96	11,540	15.8	140 mm	730	All Ad	11,540
			TOTAL RELEASED -		361,622			22,019		361,622

Appendix L.1. Pathology Chinook Health Report, Clearwater Fish Hatchery.

SUMMARY OF FISH AUTOPSY

ACCESSION NO:	96-150	LOCATION:	Clearwater
SPECIES:	Spring Chinook	AUTOPSY DATE:	4/11/96
STRAIN:	Rapid River	AGE:	juv
UNIT:	chnk rwy	SAMPLE SIZE:	20
RIVER FOR AUTOPSY:	prelib		
INVESTIGATOR(S):	Munson		
REMARKS:	Clinical signs of BKD`		

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL*	0.00	0.00	0.00
HEMATOCRIT	39.12	11.25	0.29
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	4.88	7.23	1.48

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER
**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOUTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO-BRANCHS		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	20	N	20	N	20	0	20	0	0	B	0	0	20	N	17	A	0	0	0
B1	0	F	0	S	0	1	0	1	0	R	20	1	0	S	0	B	20	1	0
B2	0	C	0	L	0	2	0	2	0	G	0	2	0	M	0	C	0	2	0
E1	0	M	0	S&L	0			3	11	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0	Mean=0.00		4	9	E	0	Mean=0.00		U	0	E	0		
H1	0	OT	0	OT	0					OT	0			T	0	F	0	Mean=0.00	
H2	0			O	0			Mean=3.45								OT	0		
M1	0																		
OT	0																		

SUMMARY OF NORMALS

20	20	20	20	20	20	20	17	20	0
SEX	M: 0		F: 0		U: 0				

GENERAL REMARKS:

FINS: Okay

GONADS:

SKIN: scaling

OTHER:

Appendix L.2. Pathology Chinook Health Report, Red River.

SUMMARY OF FISH AUTOPSY

ACCESSION NO:	96-131	LOCATION:	Red River
SPECIES:	Spring Chinook	AUTOPSY DATE:	4/11/96
STRAIN:	Red River	AGE:	juv
UNIT:	Red River Pond	SAMPLE SIZE:	20
RIVER FOR AUTOPSY:	prelib		
INVESTIGATOR(S):	Munson, Frogl		
REMARKS:	Nice fish		

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL*	0.00	0.00	0.00
HEMATOCRIT	45.66	3.11	0.07
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	6.88	2.87	0.42

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER
**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOUTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO-BRANCHS		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	20	N	20	N	20	0	20	0	0	B	0	0	20	N	20	A	0	0	0
B1	0	F	0	S	0	1	0	1	0	R	20	1	0	S	0	B	20	1	0
B2	0	C	0	L	0	2	0	2	0	G	0	2	0	M	0	C	0	2	0
E1	0	M	0	S&L	0			3	12	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0	Mean=0.00		4	7	E	0	Mean=0.00		U	0	E	0		
H1	0	OT	0	OT	0					OT	0			T	0	F	0	Mean=0.00	
H2	0			O	0			Mean=3.30								OT	0		
M1	0																		
OT	0																		

SUMMARY OF NORMALS

	20	20	20	20	20	20	20	20	20	0
SEX		M: 0		F: 0		U: 0				

GENERAL REMARKS:

FINS: Okay

GONADS:

SKIN: Appear to be smolting

OTHER:

Appendix L.3. Pathology Chinook Health Report, Crooked River.

SUMMARY OF FISH AUTOPSY

ACCESSION NO:	96-129	LOCATION:	Crooked River
SPECIES:	Spring Chinook	AUTOPSY DATE:	04/04/95
STRAIN:	Crooked River	AGE:	juv
UNIT:	N & S ponds	SAMPLE SIZE:	10
RIVER FOR AUTOPSY:	prelib		
INVESTIGATOR(S):	Munson, Frogl		
REMARKS:	Smolting		

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL*	0.00	0.00	0.00
HEMATOCRIT	48.64	1.98	0.04
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	6.57	4.23	0.64

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER
**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOUTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO-BRANCHS		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	10	N	10	N	10	0	10	0	0	B	10	0	10	N	10	A	0	0	0
B1	0	F	0	S	0	1	0	1	0	R	20	1	0	S	0	B	10	1	0
B2	0	C	0	L	0	2	0	2	3	G	0	2	0	M	0	C	0	2	0
E1	0	M	0	S&L	0			3	4	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0	Mean=0.00		4	3	E	0	Mean=0.00		U	0	E	0		
H1	0	OT	0	OT	0					OT	0			T	0	F	0	Mean=0.00	
H2	0			O	0			Mean=3.00								OT	0		
M1	0																		
OT	7																		

SUMMARY OF NORMALS

20	10	10	10	10	10	10	10	10	0
SEX	M: 0		F: 0		U: 0				

GENERAL REMARKS:

FINS: Okay
GONADS:

SKIN: descaling
OTHER:

Appendix L.4. Pathology Chinook Health Report, Powell.

SUMMARY OF FISH AUTOPSY

ACCESSION NO:	96-129	LOCATION:	Crooked River
SPECIES:	Spring Chinook	AUTOPSY DATE:	04/04/95
STRAIN:	Crooked River	AGE:	juv
UNIT:	N & S ponds	SAMPLE SIZE:	10
RIVER FOR AUTOPSY:	prelib		
INVESTIGATOR(S):	Munson		
REMARKS:	Smolting		

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL*	0.00	0.00	0.00
HEMATOCRIT	40.11	4.87	0.12
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	5.12	3.49	0.68

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER
**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOUTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO-BRANCHS		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	20	N	20	N	20	0	20	0	0	B	0	0	20	N	0	A	0	0	0
B1	0	F	0	S	0	1	0	1	0	R	20	1	0	S	0	B	7	1	0
B2	0	C	0	L	0	2	0	2	3	G	0	2	0	M	0	C	13	2	0
E1	0	M	0	S&L	0			3	4	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0	Mean=0.00		4	3	E	0	Mean=0.00		U	0	E	0		
H1	0	OT	0	OT	0					OT	0			T	0	F	0	Mean=0.00	
H2	0			O	0			Mean=3.35								OT	0		
M1	0																		
OT	7																		

SUMMARY OF NORMALS

	20	20	20	20	20	20	20	20	20	0
SEX		M: 0		F: 0		U: 0				

GENERAL REMARKS:

FINS: Okay

GONADS:

SKIN: Appear to be smoling

OTHER:

Steelhead

Appendix M. BY95 Steelhead Eggs Received at Clearwater Fish Hatchery.

Egg Take Number	Spawn Date	Eyed Egg Deliver Date	Number Eyed Eggs	Temperature Units
8	03/20/95	03/31/95	300,000	356
8	03/20/95	04/03/95	100,353	474
9	03/28/95	04/10/95	170,800	438
10	04/04/95	04/17/95	150,000	439
11	04/10/95	04/24/95	190,000	440
		TOTAL	911,153	

Machine enumeration completed at Dworshak National Fish Hatchery.

Brood Year steelhead survival from eggs to released smolts.

Stock	#Eyed Eggs	Released Fingerlings	# Fish on two year program	Percent Survival
BY-95 Dworshak B	911,153	650,344		* 71%
Total		650,344		

*The first eyed egg shipment received from Dworshak had a 76% loss due to poor egg quality.

Appendix N. BY94 Selway Steelhead Eggs Received at Clearwater Fish Hatchery.

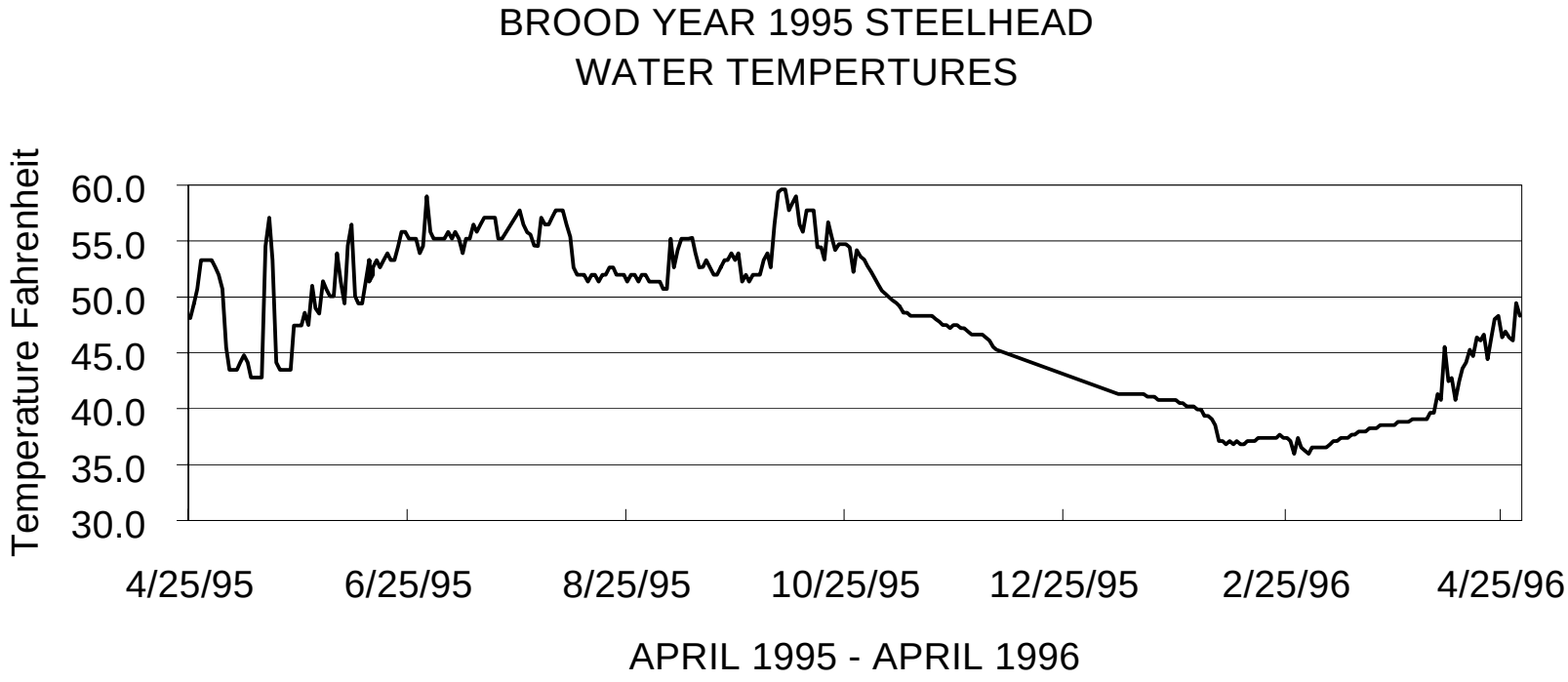
Egg Take Number	Deliver Date	Number Eyed Eggs
1	05/11/94	32,892
2	05/16/94	9,323
3	05/17/94	12,647
4	05/17/94	12,654
		67,516

Machine enumeration done at Dworshak National Fish Hatchery.

Brood Year 1994 Selway steelhead survival from eggs to released smolts.

Stock	# Green Eggs	# Eyed Eggs	Released Smolts	Percent Survival
BY-94 Selway	Reared at Dworshak Hatchery	67,516	52,372	79%
	Total	67,516		

Appendix O. Clearwater Fish Hatchery Steelhead Water Temperatures.



Incubation Apr. 95 – May 95 Early Rearing May 95 – Oct. 95 Steelhead Raceways Oct. 95. – Apr. 96

Appendix P. Steelhead Marking and Smolt Distribution.

Species	Stock	Brood Year	Release Site	Release Date	Number Released	Size No./lb	Length FL or TL	Pounds	Marks	Number of Marks Released
Steelhead (B)	North Fork	1994	S.F. Red River	10/27/94	50,781	52.0		957	46,000 CWT 5,000 PIT	51,000
Steelhead (B)	North Fork	1995	S.F. Red River	06/09/95	46,326	57.9	4	800	4,089 PITS 42,237 CWT	46,326
			SUB-TOTAL		**50,781**			**1,757**		**51,000**
Steelhead (B)	Selway / North Fork	1994	Crooked River	04/15/96	46,018	7.5	177	6,135	1,800PIT All LV	46,018
Steelhead (B)	Selway	1994	Red River	04/16/96	6,354	7.4	179	858	All LV	6,354
Steelhead (B)	North Fork	1994	Clear Creek (Kooskia Hatchery)	04/19/96	135,837	6.2	190	21,909	300 PIT All Ad	135,837
			SUB-TOTAL		**142,191**			**28,902**		**142,191**
Steelhead (B)	North Fork	1995	Red River	04/17/96	8,000	7.0	182	1,143	4,000 PIT All AD	8,000
Steelhead (B)	North Fork	1995	Red House Hole	04/17/96	185,214	7.5	177	24,695	300 PIT, All Ad 65,714 CWT	185,214
Steelhead (B)	North Fork	1995	Cottonwood Creek	04/18/96	121,290	7.4	179	16,390	300 PIT, All Ad 65,516 CWT	121,290
Steelhead (B)	North Fork	1995	Stites	04/18/96	126,009	7.6	177	16,580	300 PIT, All Ad 66,241 CWT	126,009
Steelhead (B)	North Fork	1995	Clear Creek (Kooskia Hatchery)	4/19 & 04/24/96	162,605	8.6	173	18,908	300 PIT, All Ad 65,522 CWT	162,605
			SUB-TOTAL		**603,118**			**77,716**		**603,118**
					796,090			**108,375**		**796,309**
			TOTAL RELEASED -							

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Appendix Q. Pathology Steelhead Health Report.

SUMMARY OF FISH AUTOPSY

ACCESSION NO:	96-130	LOCATION:	Crooked River
SPECIES:	Steelhead B	AUTOPSY DATE:	04/04/96
STRAIN:	Selways	AGE:	Juv
UNIT:	Cr ponds	SAMPLE SIZE:	10
RIVER FOR AUTOPSY:	Prelib		
INVESTIGATOR(S):	Munson		
REMARKS:	Smolting		

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL*	0.00	0.00	0.00
HEMATOCRIT	42.33	2.54	0.06
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	5.97	1.68	0.28

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER
**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOUTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO-BRANCHS		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	10	N	10	N	10	0	10	0	0	B	0	0	10	N	10	A	0	0	0
B1	0	F	0	S	0	1	0	1	0	R	10	1	0	S	0	B	20	1	0
B2	0	C	0	L	0	2	0	2	4	G	0	2	0	M	0	C	0	2	0
E1	0	M	0	S&L	0			3	4	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0	Mean=0.00		4	2	E	0	Mean=0.00		U	0	E	0		
H1	0	OT	0	OT	0					OT	0			T	0	F	0	Mean=0.00	
H2	0			O	0			Mean=2.80								OT	0		
M1	0																		
OT	0																		

SUMMARY OF NORMALS

20	10	10	10	10	10	10	10	10	0
SEX	M: 0		F: 0		U: 0				

GENERAL REMARKS:

FINS: okay

GONADS:

SKIN: Some descaling

OTHER:

Submitted by:

Jerry McGehee
Fish Hatchery Manager II

Scott Patterson
Assistant Fish Hatchery Manager

Brad George
Assistant Fish Hatchery Manager

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Fish Culturist

Approved by:

Virgil K. Moore, Chief
Bureau of Fisheries

Tom Rogers
Fish Hatcheries Supervisor